AVIATION AND AIRCRAFT JOURNAL

APRIL 18, 1921 VOL. X. NO. 16

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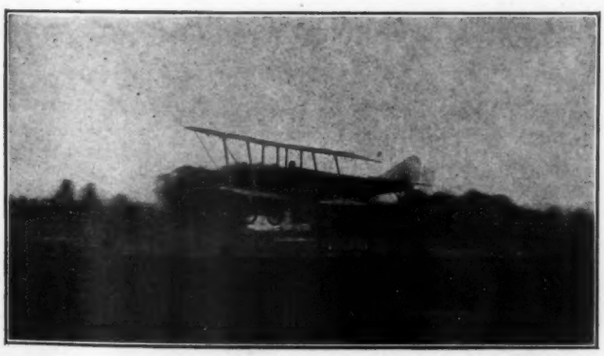

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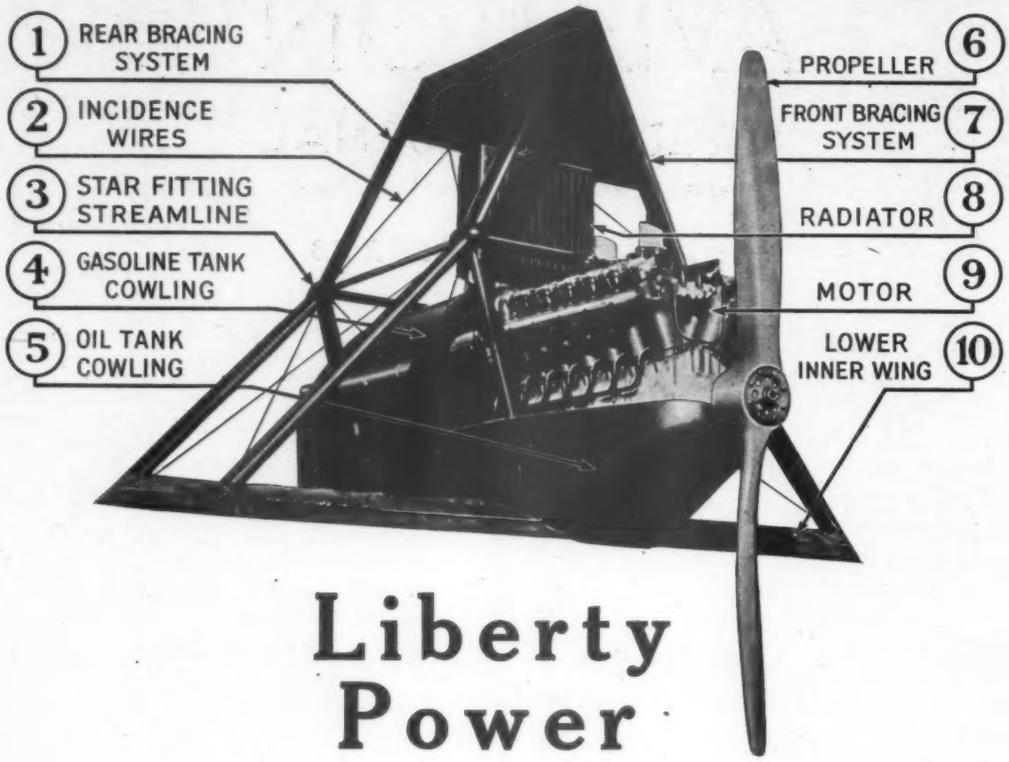

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IN war-time it is imperative that all fighting planes on which the Nation depends for defense, should be American built throughout.

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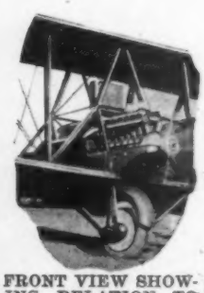

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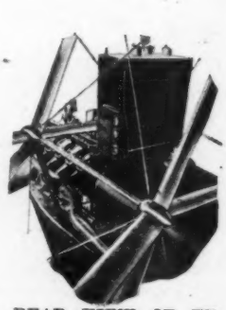

REAR VIEW OF ENGINE AND BRACING SYSTEM

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Vol. X APRIL 18, 1921 No. 18

The Air Service Vindication

AVIATION AND AIRCRAFT JOURNAL in this issue has at last set at rest many of the misstatements that have been current about the gross extravagance of our air service activities during the War. If at the time of the Armistice General Kenly could have made the statement that half of the billion and a quarter dollars appropriated for the Air Service during the war had been returned to the treasury, there would never have been investigations of all sorts and all the loose talk would have been avoided.

But the impression has been created in the public mind regarding the production of aircraft and it it will take a long time for the truth to overtake the many misstatements. It is not to be denied that the inevitable mistakes of judgment occurred, that inexcusable delays hampered the progress and other things happened which could have been avoided. Perhaps some of these may be more satisfactorily explained when all the facts are finally available.

The fact is now established that our Air Service did not cost a "billion and a half dollars", for its net cost was $598,090,781. The figure 19 per cent of the total expenditure is fixed as the proportion of the money spent for American built airplanes.

The purpose of AVIATION AND AIRCRAFT JOURNAL in investigating this subject at this late date is to once and for all time meet the argument which is constantly used in curtailing our future expenditures for air preparedness, that "a billion and a half dollars was wasted" during the war.

Efficiency of Air Transport

THE paper read by H. White Smith, chairman of the Society of British Aircraft Constructors, before the Efficiency Exhibition in London, and which is reproduced in this issue, is worth the perusal of all those concerned with the organization of commercial air lines. For, while the paper does not raise any points which are not already known to the student of air transport problems, it has the merit of summarizing in a lucid and concise manner the cardinal points of the whole question of commercial aviation. On this ground Mr. Smith's paper should prove of considerable interest to that section of the business world which is seriously beginning to consider the claims of air transport to superiority over existing means of travel and shipping.

Operators of commercial aviation enterprises whose scope is still local, but whose present success encourages them to look toward an expansion of their activities in the shape of regular inter-city services, may also find much food for thought in this paper. The high cost of operating converted military aircraft on commercial services is a well-known fact and it is encouraging to see Mr. Smith state on the ground of experience gained by the English cross-Channel air lines, that by the use of specially designed commercial aircraft the cost of the ton mile has been reduced to less than half. Since the post-war machines which produced this reduction in operating costs are orthodox "strut-and-cross-wire" biplanes, it may be expected that with the introduction of strutless, low-resistance machines, which would be suitably weatherproofed, a still greater efficiency—and a corresponding economy in operation—will be achieved.

The concluding words of the paper apply with particular forcefulness to this country, although they were meant to apply to British conditions. Mr. Smith points out that, since Great Britain cannot afford to maintain more than a comparatively small standing air force, the only way to insure a reserve of air power is by creating a commercial air fleet. He concludes by saying that "it is false economy to neglect the development of a form of national defense which can be run on business lines, and this neglect may involve us some day in suddenly spending vast sums of money on the extension of our military and naval air force."

The truth of this assertion needs no stressing, particularly when applied to American conditions, considering the price the United States paid for its aerial unpreparedness upon declaring war on Germany.

Japan's Aerial Efforts

INFORMATION on the efforts Japan is making with a view to building up a thoroughly up-to-date air force with all the manufacturing facilities such a service requires is coming in with growing frequency. While the information at hand is not, as a rule, very comprehensive, a sufficient number of news items is available to create the impression that Japan shirks no effort to build up an air force that may, in case of war compare with the air forces of the other great powers.

A large number of foreign flying instructors and aeronautical engineers has been engaged to build up the personnel and material sides of the Japanese air forces and, judging from some recent performances, much progress has already been made. Several shipbuilding firms have acquired foreign licenses for the manufacture of naval aircraft and aeronautical engines, and some European firms have established branch organizations in Japan. According to All the World's Aircraft, 1920, there were in Japan at the end of last year twelve private aircraft manufacturing firms, including one building kite balloons and airships, to which number must be added the army and navy aircraft factories.

At the same time Japanese military and naval missions have for some time been in Europe inspecting the latest products of the leading aircraft manufacturers and orders have been let, for unknown numbers of machines, to various British, French and Italian firms. The recent order for five Farman Goliath passenger carriers—which can easily be converted into long range bombers, the more so as they were originally designed as such—is a point in case. All of this shows that Japan is neglecting no opportunity to keep abreast of the times and to prepare for possible emergencies.

Cost of War Aviation Only $598,090,781

Authenticated Official Report of Liquidation Division of U. S. Air Service on Total Appropriation Corrects Misconception of Air Service Expenditures and Shows that ***$582,564,781 Has Been Returned to U. S. Treasury***

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The general impression that a "billion dollars was spent for aircraft during the war and that the production program was a failure, not a score of American built planes reaching the front", is finally refuted by figures compiled by AVIATION AND AIRCRAFT JOURNAL from liquidation reports on file in the office of the Chief of Air Service in Washington. The truth is that the actual cost of all war contracts for aircraft, aeronautical equipment, landing fields, foreign purchases, in fact, everything connected with the equipment and maintenance of our air force at home and abroad, cost the taxpayers less than six hundred million dollars.

The actual amounts appropriated for the Army Air Service during the war aggregated $1,687,054,758.00. From this total amount there were revoked by Congress, sums aggregating $487,000,000.00, making the net amount available for expenditure by the War Department $1,200,054,758.00.

Until now the charge has been made and the public has been led to believe that most of this money was spent and largely wasted. **It is now revealed for the first time by official and authenticated reports made by the Liquidation Division of the Air Service that of the amount available for expenditure $582,564,781.00 has been returned to the United States Treasury.**

And there *were* airplanes produced and delivered to the Government, despite the canard that the United States "got nothing for its money". The total amount spent for Army airplanes in the United States was $113,721,043.39, or 19 per cent of the total Air Service expenditures. For that money the Government received 13,894 American built airplanes. The Government spent $139,000,000 abroad for training and the purchase of airplanes, engines, construction of cantonments and production centers and received among the other equipment 5,198 complete airplanes, making a total of 19,092 airplanes produced for the United States. These were produced in a period of 21 months. Our production for this period exceeds that of any other country for a like period. It is further substantiation of the belief that the rapidly increasing air power of America forced the war to an early conclusion, for shortly before the Armistice the central powers had only 3,309 airplanes on the front. At the signing of the Armistice in addition to the 5,198 airplanes purchased abroad, 2,091 American built airplanes had been shipped to France and 1,040 were at points of embarkation or in transit. One thousand four hundred and forty airplanes had been actually received in France, of which 667 American made machines were *actually in service at the front.*

Only within the last few days have these figures been in such form that they could be used in vindication of the war time air service activities of the government. The Chief of Air Service states that figures "have been published and available for public information for several months, *except* the important figures showing net expenditures after liquidation and the amount of surplus stocks sold or otherwise disposed of". It is therefore with great satisfaction that AVIATION AND AIRCRAFT JOURNAL corrects the gross misstatements of the past two years.

After two years of adjusting cancelled war contracts, as previously stated, $582,564,781. of the $1,200,054,758. available has been *returned* to the *Treasury.*

The amount actually expended from the money appropriated for the War Department for the Air Service, in this country and abroad during the war, was $617,489,977.00. From this have been deducted the amounts realized by surplus material sales since the armistice of $19,399,196, making the **net cost of our aeronautical endeavor during the war, $598,090.781.**

The seemingly unanswerable question before investigating committees, Congressional and otherwise, before newspaper writers and the public, has been "what became of over one and one half billion dollars appropriated for our Air Service?"

The answer is found in the following figures which were secured from the office of the Chief of Air Service. This accounting has been necessarily slow. The magnitude of the aircraft program and the multiplicity of its ramifications, both in production and organization activities, in creating an Air Service from nothing to begin with—and it must be borne in mind that preparations were made for a fight to a finish—have made this task of accounting particularly tedious and of long duration. Further, the final accounting could not be made until suspended and cancelled contracts were settled and finally liquidated.

In considering the amount actually spent at home and abroad one must take into account the fact that these expenditures cover all items and that only a comparatively small percentage was spent for airplanes. It is necessary to keep in mind this fact, so that a consideration of future aviation activities may not be warped by prejudice growing out of misconception heretofore circulated about our airplane industry. As will be seen from the figures presented there were expended for Army airplanes and spare parts with the "aeronautic industry" only $84,704,155.16, or 14 per cent of the total Air Service expenditures. Emergency war organizations received orders for $29,016,888.23. The total amount spent for Army airplanes in the United States was $113,721,043.39, or 19 per cent of the total Air Service expenditures.

Looking back over the situation, it now is apparent that our airplane industry *did not fail* during the war. Starting with nothing, (as only 142 airplanes had been built for the Army in nine years previous to 1917) it completed and delivered to the government, as shown in detail by the following tabulations, 13,894 complete airplanes, together with spare parts.

The problem, on our entering the war, was to create *both* an Air Service and an aircraft industry. In *both* we succeeded, for on Nov. 11, 1918, the Air Service consisted of 20,568 officers and 174,456 enlisted men and civilian personnel, and 48 flying fields in operation.

In addition to airplanes for the Army our aircraft industry during this period, manufactured a large number of seaplanes and flying boats, for the Navy. It is a significant fact that during all of this period, while there has been almost constant discussion of our "failure in aviation," practically all the criticism has been directed toward the work of the War Department. Most of the Navy's contracts for procurement of seaplanes and flying boats, etc., were placed with the aircraft industry and officers in the Navy Department credit the industry with having met their requirements promptly and regularly.

The production of engines as shown by the final statements

is also highly creditable. There was spent for aeronautical engines $244,838,162.30 in this country and 41,953 engines and spare parts were produced and delivered.

From these revised figures, it must be conceded that the American airplane industry gave a splendid account of itself during the War. There may be a difference of opinion as to the adaptability of the American made machines to meet the requirements of the service, but it must be remembered that the airplane manufacturers could make only the machines that they were ordered to make and that during the war period no attempt was made by the War Department to produce planes of American design, the sole effort toward original design and production being centered on the Liberty engine.

It is due perhaps more to the advice of our Allies than to our advisers in Washington that more American made airplanes did not reach the front earlier. When the United States entered the War, our Allies urged that we first furnish raw material, mechanics and train aviators. Types of aircraft were changing every few months. A new type on either side with a few miles more speed, greater maneuverability or greater carrying capacity would render all previous designs obsolete. Under such conditions it was obvious that any American production program should be based on European experience and advice.

That the above facts may be verified from official sources the following statements are printed in original form.

April 6, 1921.

MAJOR LESTER D. GARDNER,
c/o AVIATION AND AIRCRAFT JOURNAL,
225 Fourth Avenue,
New York City.

Dear Sir:—

In response to your inquiry as to the exact amount of aeronautical appropriations made by Congress during the war period, accompanied by an additional statement showing the amount actually expended from these appropriations, and in a general way the purposes for which the expenditures were made, the Chief of Air Service directs me to advise you as follows:

There is enclosed herewith a statement, File Number A 00.3/53, showing all aeronautical appropriations for U. S. Army from 1917 to 1918, inclusive, giving (after revocations made by Congress) a net total of $1,200,054,758.

Of this total amount there has been disbursed or reserved for final settlement of all claims to March 31, 1921, the sum of $617,489,977.

This sum, $617,489,977. is the gross amount expended for all of our aeronautic activities from the appropriations for the war period above mentioned. Your attention is directed to the fact that this includes nearly $2,000,000. that has been reserved to cover three remaining contracts, not yet liquidated.

From surplus stocks, there has been sold, since the war, aeronautical property bought under these appropriations, on which the War Department has realized a cash return of $19,399,196. In addition to the actual sale of surplus material, there has been transferred, without funds, to other governmental departments property to the value of $5,139,315.33. There remains yet to be disposed of other property declared surplus, to the value of $15,931,930.37. Disregarding any cash returns that may be realized from future sale of the latter, as well as the transfers to other departments, but deducting the sum already received from sales ($19,399,196) it will be seen that the net cost of our aeronautical endeavor during the war, according to the present figure is $598,090,781.

There is also included in the above mentioned statement a tabulation covering the disbursements for the procurement of airplanes, aeronautical engines, balloons and airships arranged according to industries. The figures contained in this statement are taken from "Aircraft Surveys," House Document No. 621, 66th Congress, and show figures as of November 1, 1919. These figures were prepared for Congress one year after the Armistice, and after all deliveries had been completed. They have been, in some cases, slightly modified by final liquidation of contracts, but a complete analysis of liquidated figures is not immediately available. All these, however, are included in the final liquidation, and covered in the preceding paragraph.

There are also embodied in the same statement, figures showing other items of expenditure from these war aeronautic appropriations. The figures on this statement are taken from the figures submitted to Congress by the Air Service, and published in Part II, of "United Air Service, Hearing before a Subcommittee of the Committee on Military Affairs, House of Representatives, 66th Congress, 2nd Session". With these figures before you, you will be able to determine the purpose for which the $617,489,977 was spent. These figures, as above indicated, are not in each case final, as they were prepared before liquidation, but they are sufficiently accurate for practical purposes in considering this question.

The subjects of your inquiry cannot be properly considered, however, without reference to the further fact that in addition to the stocks declared surplus and sold or offered for sale since the war, we hold, as additional salvage from war expenditures, much other aeronautical equipment constituting a national asset, such as complete airplanes, extra engines, balloons and other equipment, now in use or reserved for future use of the service. In addition to this equipment, and probably the greatest asset, from the war, are the thousands of trained flying officers and mechanics, together with our training fields, hangars and other ground facilities. All of the figures contained in the above have been published and available for public information for several months, except the important figure showing net expenditures after liquidation and the amount of surplus stocks sold or otherwise disposed of.

Very respectfully,
H. M. HICKAM,
Major, Air Service,
Chief of Information Group.

War Aeronautical Appropriations U. S. Army, 1917-1918

The following information sets forth the appropriations specifically provided by Congress in the various bills listed. The actual total amount for the bills will vary for some of these figures, as the bills included appropriations for the purposes of the Signal Corps proper, as well as for aeronautics in the Signal Corps.

These figures show the allotments made to cover purchases and contracts, and are not figures representing actual disbursements. It is practically impossible to secure figures on the actual disbursements under each and every class of material or service paid for from Air Service records only.

The figures for the allotments and unallotted balances in this tabulation were obtained from "United Air Service", "Hearing Before a Sub-committee of the Committee on Military Affairs, House of Representatives, Sixty-sixth Congress, Second Session", statement of Lieut. Col. Jacob E. Fickel, Air Service, pages 162 etseq., with the exception of the item of $8,000,000.00, the allotments under which are not shown in the hearings.

As the statements in the hearings of the date of June 30, 1919, show, the allotments include monies not only, therefore, actually disbursed for aircraft material, accessories and services, but include also funds reserved for settlement of cancelled or suspended contracts.

It will be seen from the statements in the hearings that it is practically impossible to arrive at figures which show the actual monies disbursed for purely aeronautical purposes; e.g., Page 168, item 3, some of these telephone systems were installed at Air Service stations. Under Par. 4, some of this radio equipment was for the Air Service. Par. 5 includes also transportation for the Air Service. However, in the attached tabulation, there have been included only those allotments specifically named as for the Air Service.

On page 169, the items under "Aviation, Seacoast Defenses", "Aviation, Seacoast Defenses, Insular Possessions, Hawaii", or "Aviation, Seacoast Defenses, Insular Possessions, Philippines," include monies appropriated for aeronautics, prior to the declaration of war, which monies were partially used during the war, and even in 1921.

Other items in these hearings include purely Signal Corps allotments, which have no relation to aeronautics.

Reference is made, in this connection, to the document, "Consolidated List of Aircraft Contracts and Deliveries, April 6, 1917, to November 1, 1919", file number A-10.2/22, compiled in the Information Group, O. C. A. S., after making minor corrections in "Aircraft Surveys" House Document No. 621 included as an appendix herein. The figures shown in this statement represent actual disbursements, as of November 1, 1919. The document does not include settlements made subsequently which change the actual final payments to the aeronautical industries and to outside industries for aircraft material. This document is mentioned in order to explain the discrepancy in the figures between those shown therein and the figures shown in the hearings above mentioned.

The allotments under the appropriation of $8,000,000.00 were supplied by the Liquidation Division, O.C.A.S. The items mentioned in the attached tabulation as unallotted balances were returned to the Treasury.

The concluding statement attached, which purports to show the total actual disbursements, was compiled March 26, 1921, by the Liquidation Division.

So that the items of all war time Government appropriations may be clearly understood the following official detailed tabulation is furnished:

War Aeronautical Appropriations U. S. Army

Act May 12, 1917	$10,800,000	
Act Oct. 6, 1917	40,000,000	
Act June 12, 1917	500,000	
Act of June 15, 1917	43,450,000	
Act of July 24, 1917	640,000,000	
Act of July 8, 1918	8,000,000	
Act of July 9, 1918	760,000,000	
Act of July 9, 1918	124,304,758	
Act of Nov. 4, 1918	60,000,000	$1,687,054,758
Less revocations		487,000,000
		$1,200,054,758

Following is a tabulation, appropriation by appropriation, with the allotments for aeronautics, unallotted balances and revocations shown under each.

Appropriations		Allotments Unallotted Balances Revocations
$10,800,000		
40,000,000		
	Allotments	$8,293,128.73
	Used by S. C. proper	40,506,871.27
	Revocation	2,000,000.00
$50,800,000		50,800,000.
500,000	Allotments	480,764.67
	Unallotted balance	19,235.33
500,000		500,000.
43,450,000	Allotments	
	Unallotted balance	32,144,975.49
	Used for S. C. proper	
		11,305,024.51
43,450,000		43,450,000.
640,000,000	Allotments	606,872,404.10
	Unallotted balance	33,127,595.90
640,000,000		640,000,000.
8,000,000	Allotments	4,858,591.48
	Unallotted balance	3,141,408.52
8,000,000		8,000,000.
$760,000,000	Revocation	$400,000,000.
	Allotments	288,164,487.41
	Unallotted balance	71,835,512.59
760,000,000		760,000,000.
60,000,000	Revocations	85,000,000.
$124,304,758	Allotments	91,935,311.81
	Unallotted balance	7,369,446.19
184,304,758		184,304,758.

Suspension uncompleted portions of contracts at time of armistice	509,199,915.99
Settled since war to Mar. 25, 1921	93,940,229.30
Bal. returned or to be returned to Treasury	415,259,686.69
Total appropriations	1,200,054,758.00
Less amount for suspension contracts	509,199,915.99
	690,854,842.01
Less unalloted balance and S. C. proper as above	167,305,094.31
	523,549,747.70
Add disbursements since armistice	93,940,229.30
Grand total disbursements	617,489,977.00
Total appropriations	1,200,054,758.00
Disbursements, including $1,789,000 held for settlement of 3 contracts outstanding, 31 March, 1921	617,489,977.00
Savings returned to Treasury	582,564,781.00
Cash received from disposal of property declared surplus	19,399,196.00
Actual cost air endeavor in war	$598,090,781.00

Appendix I.

Consolidated List of Aircraft Contracts and Deliveries in U. S. April 6, 1917—November 1, 1919

Airplanes—Engines—Airships—Balloons (Supply, Free, Toy, Observation, Target, Propaganda, Experimental)

Arranged by Industries and by Contractors

Rearranged from corrected copy of "Aircraft Surveys", House Document No. 621, 66th Congress, 2nd Session, on file in Office, Chief of Air Service, to show the amounts paid to each contractor, divided between the Aeronautical, Automobile and Kindred, and Miscellaneous industries. Only disbursements to November 1, 1919, are shown: consequently, settlements in liquidation of suspended contracts are not included. The above document is public and for all practical purposes shows the amounts expended for flying material.

Those concerns which were producing airplanes, aircraft engines, balloons or airships prior to the World War and generally accepted as pioneer aeronautical manufacturers, and those other concerns organized during the war period and who are continuing active operations in aeronautics, have been considered in the classification "Aeronautical Industry".

Airplanes

Aeronautical Industry

Number Received		Amount
4014	Curtiss	$29,366,397.24
1033	Standard	15,589,694.63
1	Sturtevant	11,250.00
51	Wright	329,250.00
131	L. W. F.	1,649,377.50
10	Glenn Martin	822,575.37
599	Thomas-Morse	3,106,103.37
7	Lewis & Vought	61,676.00
2	Heinrich	11,328.00
4	Gallaudet	140,013.02
300	Breese	591,325.85
1	Burgess	26,009.50
0	Aeromarine	.....
50	Fowler	323,166.90
3506	Dayton-Wright	31,446,575.88
25	Packard	1,084,670.12
8	Ordnance	144,742.98
		$84,704,155.16

Automobile & Kindred Industries

2000	Fisher	19,643,837.39
0	Brewster	200,000.00
2000		19,843,837.39

Miscellaneous (Emergency War Organizations, New Concerns, Missions, etc.)

Number Received		Amount
0	Empire	15,000.00
3	Pigeon-Fraser	19,075.00
200	Liberty Iron Works	1,002,366.28
1	Italian War Mission	49,227.79
2	Equipment Holding	10,000.00
588	Springfield Aircraft Co.	3,457,229.93

450	St. Louis	2,137,500.00
50	U. S. Aircraft Co.	326,170.10
75	Howell & Lesser	394,121.41
1	Schiefer	11,720.00
100	Various mfrs. for Handley Page Parts	.....
680	Canadian Aero Co.	1,733,136.90
2	Pacific	17,504.74
2152		$9,173,050.84

Recapitulation of Airplanes

9742	Aeronautical Industry	84,704,155.16
2000	Automobile and Kindred Industry	19,843,837.39
2152	Miscellaneous	9,173,050.84
13894		$113,721,043.39

Engines

Aeronautical Industry

2	Ordnance	.....*
1	Lawrance	21,000.00
1255	Hall-Scott	2,944,631.03
750	Curtiss	634,547.23
41	Standard	215,093.14
94	L. W. F.	.....*
73	Sturtevant	*302,000.00
30	Burgess	133,500.00
5816	Wright	54,372,268.68
69	Thomas-Morse	321,990.08
4	Gallaudet	.....*
6630	Packard	42,780,339.50
14765		101,725,369.64

Automobile and Kindred Industries

4	Van Blerck	8,913.04
4	Sterling	11,680.59
2	Wisconsin	2,878.00
40	Duesenberg	4,934,798.62
0	Pierce Arrow	1,584,164.81
2543	General Motors	9,766,499.68
8500	Willys-Overland	21,030,871.60
61	General Vehicle	43,700.00
451	Excelsior Motor	295,000.00
2000	Nordyke & Marmon	18,015,240.38
1	Winton	1,485.00
1	Trego	1,145,008.11
6500	Lincoln	45,859,985.18
3950	Ford	29,401,393.62
1	Willys-Morrow	400.00
24058		$132,102,018.63

Miscellaneous

Number Received		Amount
400	Canadian Aero	252,000.00
121	Aero Engineering	523,723.14
1	Schiefer	.....*
4	Italian War Mission	.....*
8	British War Mission	.....
2585	Union Switch	10,131,298.89
6	Murray & Tregurtha	103,752.00
3	Equipment Holding	.....*
2	Pacific	.....*
3130		$11,010,774.03

Recapitulation of Engines

14765	Aeronautical Industry	101,725,369.64
24058	Automobile & Kindred Industry	132,102,018.63
3130	Miscellaneous	11,010,774.03
41953		244,838,162.30

* Amounts wholly or partly included in same contracts covering airplanes.

Balloons and Airships

Aero Industry

128	Connecticut	393,464.10
28	Knabenshue	198,501.66
1	Fr.-American	1,800.00
687*	Goodyear	4,160,588.19
844		$4,754,353.95

* Includes one airship

Automobile Industry

249	Goodrich	1,788,253.94
6437	U. S. Rubber	428,252.68
7	Firestone	76,223.56
2275	Revere	2,030.63
8968		$2,294,760.81

Miscellaneous

3	Halsey	1,185.24
161	Scott	18,579.71
1	Columbia	60.00
22,866	(pilot balloons) Faultless	1,608.30
44	Navy Dept.	70,000.00
8,500	(pilot balloons) Sterling	8,785.00
31,575	Total	100,168.25

Recapitulation of Balloons

41,387	Total Balloons & Airships	
	Total Expenditure	$7,149,283.01

Appendix No. II

Disposal of Surplus Material

Following is a statement of aeronautical material declared surplus in the U. S. Army Air Service and disposed of, as of March 23, 1921. (Memorandum to Information Group from Acting Chief, Material, Disposals and Salvage Division, March 31, 1921).

Total value declared surplus (cost to Government)			$103,412,028.07
Value of Material disposed of (cost to Government)			
Adjustments, Wastage, Depreciation..	$4,403,240.83		
Material absorbed in settlement of claims	6,372,000.00		
Transferred to other Air Service activities	17,205,367.06		
Transferred to other Government Departments—no funds	5,139,315.33		
Total sold—			
(Government Dept's . 19,380.52			
(Commercial 54,340,893.96		54,360,274.48	87,480,197.70
Percentage of amount disposed of		84.59	
Actual receipts for amounts disposed of			19,399,196.00
Value of remainder yet to be disposed of (cost to Govt.)			15,931,830.37

Other Expenditures

The above figures account for $365,708,485.30 of the total wartime aeronautical expenditures for the Army as follows:

Airplanes	$113,721,043.39
Engines	244,838,162.30
Balloons	7,149,283.01
	$365,708,488.70

This leaves $251,781,488.30 to be accounted for in the expenditures for other purposes.

Below are figures which will show these main expenditures in concrete form:

TRAINING STATIONS.

30	Flying schools and fields	$ 55,587,422.74	
5	Balloon schools	2,510,496.01	
1	Aerial photo school	1,200.00	
1	Radio school and laboratory	486,350.00	
1	Aero gunnery school	380,000.00	
1	Mechanics' schools	158,900.00	
8	Warehouses and depots	5,114,041.67	
3	Engine repair depots	1,962,120.00	
3	Concentration camps	2,406,700.00	
5	Acceptance parks and experimental station	641,533.50	
3	Sundry stations	479,154.55	
			$ 69,727,918.47

Rental for flying fields, schools, depots, rights of way, buildings, warehouses, wharves, (acreage owned by U. S. not included in these figures)	709,899.72
Foreign expenditures (estimated) for airplanes, engines, fields and other purchases	139,000,000.00

(p. 184, United Air Service Hearing, Part 2)

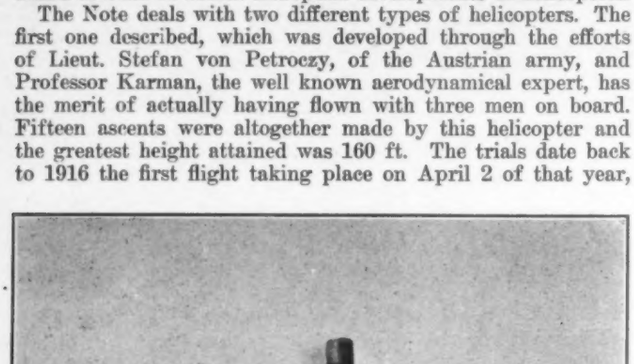
Miscellaneous:	
Pay of personnel, officers, enlisted men and civilians, machine guns, ammunition, bombs, cameras, flying, clothing and other purchases	42,343,670.11
	$251,781,488.30

In the next issue of Aviation and Aircraft Journal will appear a complete and detailed account of where the $617,489,977 was spent both here and abroad.

European Developments in Helicopters

The National Advisory Committee for Aeronautics has just issued its Technical Note No. 47, which contains the first detailed account of recent European developments in helicopters.

The Note deals with two different types of helicopters. The first one described, which was developed through the efforts of Lieut. Stefan von Petroczy, of the Austrian army, and Professor Karman, the well known aerodynamical expert, has the merit of actually having flown with three men on board. Fifteen ascents were altogether made by this helicopter and the greatest height attained was 160 ft. The trials date back to 1916 the first flight taking place on April 2 of that year,



KARMAN—PETROCZY HELICOPTER DURING ONE OF ITS TRIALS

while the last ascent occurred on June 10, 1916, when the machine was wrecked without however causing any fatalities.

The section of the Note dealing with this helicopter and with its applications is credited to Professor Karman, the information having apparently been taken from a report made by the author.

The second part of the Note describes the Lacoin-Damblanc helicopter, construction on which started two years ago near Paris, France, with the financial assistance of the French air department. This machine differs from the Karman-Petroczy helicopter mainly in that the lifting apparatus consists of two propellers rotating on separate shafts, whereas on the former machine the propellers were concentrically arranged. This machine has not flown as yet.

Following is an excerpt from the Technical Note issued by the N.A.C.A.:—

Tests of the Karman-Petroczy Helicopters

Preparatory Work. The tests in question were consequent upon the acceptance of a proposal for the construction of a captive helicopter, offered by First Lieut. Stefan von Petroczy, then Commander of Balloon Pilot Instruction, to the Austro-Hungarian War Office. Lieutenant von Petroczy also requested to be accredited with a certain sum for testing expenses.

The first tests were made at the Austrian Airplane Factory, Ltd., Wiener-Neustadt, with propellers of rather large diameter. The Daimler Works at Wiener-Neustadt also received an order from the Aviation Arsenal to hurry on the construction of a light 300 hp. electro-motor originally intended for giant airplanes. As this motor was intended to weigh 550 lb. only, according to the statement of the firm, the possibility of constructing an electro-motor with power provided by means of a cable was taken into consideration.

The Austrian Airplane Factory proceeded no further than general drafts. When Prof. Karman was entrusted with the direction of all the tests of the captive helicopter, in the early part of 1917, the work was commenced systematically along two lines. First of all, tests were made at the propeller-testing laboratory at Fischamend; second, model tests were carried out in order to throw light on stability conditions, beginning with very small models worked by rubber cords, then with a heavier 66 lb. model driven by a 5 hp. compressed air engine specially constructed for the purpose.

These tests led to the discovery of a special kind of cable, which ensures stability and which was used in all later models.

On the basis of the above-mentioned preliminaries, tests were proceeded with along two lines: One by means of electric power, and the other with gasoline engines of the rotary type. A short description of these two methods, with a report of the tests made in connection follows.

The Captive Helicopter Driven by Electric Power. The machine was completely equipped with electro-motor, electric cable and winch before being tested working on the ground. The framework itself was composed of steel tubes, with an observer's car in the center, from which there was a clear view and firing range in all directions. The lifting power was furnished by four propellers driven by a motor by means of cone gear. Its weight empty, including motor and propeller, was about 1,400 lb. The electro-motor weighed 430 lb., according to the Daimler Co., its output should have been 225 hp. (originally 300 hp. for 550 lb. weight), and it has actually yielded 190 hp., though in that case the motor overheated to such an extent that after 15 min. running it had to be stopped. Even with this reduced power, the lifting tests proved successful, for the machine rose to a low altitude with three passengers.

The advisability of equipping the already completed machine with two rotary engines, requiring the installment of transmission gear, was considered, but the idea was not carried out for want of suitable engines.

The Captive Helicopter Driven by Gasoline Engines. The captive helicopter fitted with gasoline engines consisted of a 3-armed frame made of steel tubes, in which three reconstructed Le Rhone engines, of 120 hp. each, were mounted. The engines drove two propeller shafts, revolving in opposite directions by means of a transmission gear, and these propeller shafts in turn drove two wooden propellers, each 20 ft. in diameter, at about 600 r.p.m. Three gasoline tanks were installed near the motors.

The entire system was supported by a large buffer, which was kept tightly filled with air through an air-pump driven by the engines; under the end of each arm three small buffers were similarly disposed. The object of these buffers was to reduce the shock in abrupt landings. The observer's seat, made of veneer, was situated over the propellers and strongly secured to the stationary gear-case by the concave interior propeller shaft. A machine-gun turret was located on the upper rim of the observer's seat.

A parachute was fitted beside the observer. It had an area of 2,690 sq. ft. and was intended, in case of sudden stoppage of the motor, to bear the weight of the entire installation, including the observer. The parachute was to operate either automatically or under control.

Automatically the parachute operates in such wise that when a regulator adjusted for the purpose, falls below a certain number of revolutions of the propeller, it releases a mechanism

which ejects the parachute. This ejection from the center causes the parachute to open instantly, and tests have proved that it begins to work after a drop of about 80 ft. This device thus insures the captive helicopter against damage, in case the engines should stop at low altitudes. The same mechanism brings the motor to a standstill at the time of ejecting the parachute.

The parachute may also be worked by hand by the observer, who is furthermore provided with a pack parachute for personal safety. A need for the use of the parachute occurs only when at least two engines have stopped, two engines being capable of maintaining the propeler at a sufficiently high rate of revolution.

The climb takes place as follows: When the observer has taken up his position, the engines are started, and this creates no difficulty by reason of the fact that *one* engine at work causes the others to revolve. The functioning of the motor can be controlled by the observer, and future types of the captive helicopter will have the necessary instruments located within reach of the observer. As soon as the engine has attained the full number of revolutions, a signal will be given for the loosening of the winch, and the machine will then, according to present experience, climb at a speed of about 4 ft. per sec. This climbing speed mainly depends upon the pitch of the propeller and the direction of the wind, and it can therefore be considerably increased. The captive helicopter is brought down by reversing the winch.

Up to date, the engines have always run at full intake, in which case the excess of lift must be compensated. In future, the engines will be throttled in order to diminish the work of the winch.

The total weight of the captive helicopter, with engine and fuel for one hour, but not including the observer and the machine-gun, is about 2,900 lb. It is strongly constructed, and some slight lessening of weight may yet be attained. At the start the total weight lifted was about 4,000 lb., that is, about 11 lb. per hp. This number can be considerably augmented by enlarging the propellers.

The original type of captive helicopter driven by gasoline engines power was manufactured by the firm of Dr. Liptak, Ltd., Budapest- Szentlörincz under the special supervision of Professor Karman's collaborator, Lieut. Eng. W. Zurovec, and the above-named firm owns their patent.

It may here be mentioned that Lieutenant von Petroczy was most energetic in promoting the work above described.

Fifteen Free Flights Made

Test Flights with Gasoline Machine. The reports of the test-flights undertaken may be summed up as follows:

From April 2 to 5, lift and stability tests at low heights, duration tests up to 60 min.

From May 17 to June 10, climbing to from 30 ft. to 160 ft. altitude. Results: Lift excess on the ground to a load of 4 men. Perfectly tranquil soaring at an altitude of 160 ft. Wind velocity during tests up to 26 ft. p. sec.

A full flight view and the general outline of this machine are shown in the accompanying illustrations.

After about fifteen successful flight tests, the machine had a breakdown when landing on June 10. The power of the Le Rhone engines, which had been recently repaired, decreased so considerably that there was an insufficient excess of thrust, and the machine therefore oscillated violently, especially while being brought down. The crew abandoned it, and the machine turned over on the ground, the propeller-blades sticking into the earth.

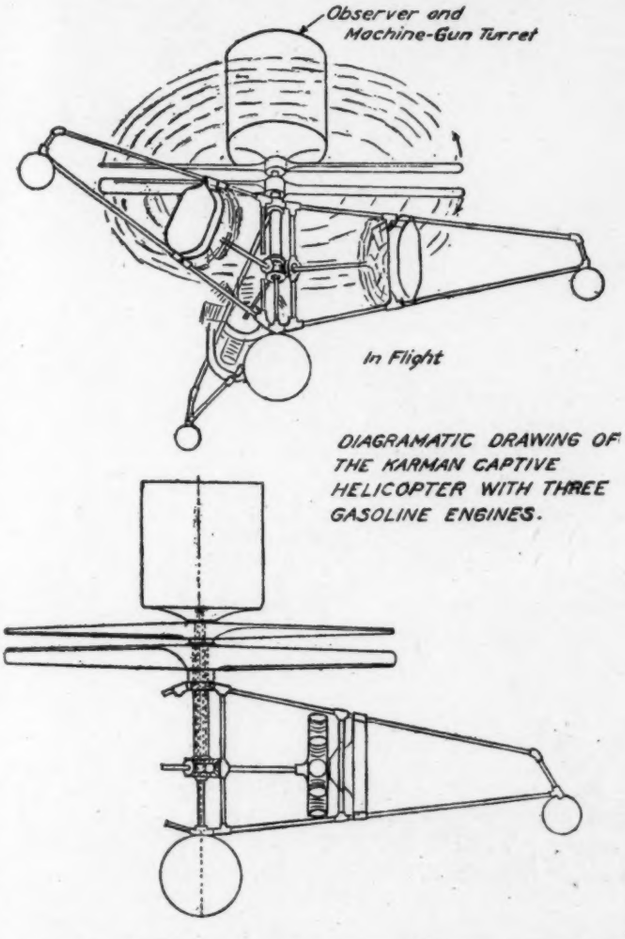
Considering the state of the motors, Professor Karman and Lieutenant Zurovec had wished to omit the tests (there being a wind velocity of 26 ft. p. sec.), but they were urged to carry them on by the testing commission, as a result of which the machine was wrecked.

The results fully confirmed those already arrived at with model tests, so far as stability is concerned. Observations made in the wind proved that, in addition to the fundamental demand for ample excess of thrust, the position of the center of gravity of the machine in its relation to the plane of rotation of the propeller is of great importance. The results obtained in that respect, both in theory and by means of practical tests, should be of the utmost value as applied to the construction of a second type.

Applications of the Captive Helicopter

(*a*) *Captive Helicopter with Crew, for Observation Purposes —During War on Land.* The advantages of the captive helicopter as compared to captive balloons are as follows: They are but slightly visible and therefore provide limited target area for artillery; they are mounted with guns and are specially adapted for shooting upward during attacks by airplanes; they are non-inflammable, they can be started without any loss of time and can be rapidly transferred from one place to another.

The comparison may be continued by stating that a balloon section on the southwestern (Italian) front, with one balloon



DIAGRAMMATIC SKETCHES OF THE KARMAN—PETROCZY HELICOPTER

requires 1 automobile winch-wagon, 2 automobile gas-wagons, 3 freight wagons, 6 officers and 137 men; whereas a captive helicopter requires 1 automobile car with three trailers, 1 motor truck, 6 officers and 20 men.

(*b*) *Captive Helicopters for Observation from Battle-Ships.* Adapted in a suitable manner, the captive helicopter might prove to be the best possible means of taking long-distance observations from battle-ships.

(*c*) *Captive Helicopters for the Protection of Open Towns and Coasts from Airplane Raids.* A series of captive helicopters would not only be able to give warning of the approach of enemy aircraft, from a long distance, but might also be able to open effective defensive firing, if properly armed.

(*d*) *Captive Helicopters without Crew for Radio Purposes.* Tests hitherto caried out with kite-balloons or antenna have always been unsuccessful either on account of a breakdown of the kite-apparatus at a low wind velocity, or because of disturbing motion of the balloon antenna during squalls. These difficulties would be avoided by the use of captive helicopters and are therefore of particular utility for colonies

and districts where stable mast-construction cannot easily be carried out and which may also give rise to great outlay.

(e) *Captive Helicopters for Meteorological Work.* By means of the captive helicopter, registering devices can easily be taken up and measurements carried out rapidly in all weathers.

The Damblanc Helicopter

Description of the Machine. The machine comprises: two rotating wings; a fuselage; two stabilizing planes with their control; a rudder with its control; a landing gear; two engine sets with their automatic clutch device, transmission of movement and elastic coupling; and a warping device with controls.

Rotating Wings. Each wing is formed of four blades assembled by means of four tubes on a crossbar revolving about the axis of the wings by means of ball bearings. Each blade has an area of about 54 sq. ft.

Fuselage. This consists of two parts: the fore part is metallic and is formed of steel tubes jointed together in lattice work and linked up by steel wire bracing. The other part to the rear is formed of a wooden frame and is also in lattice work and braced.

Stabilizing Planes. There are two planes situated to the rear of the fuselage and maintained by a braced beam. They are controlled by a metallic cable worked by a wheel.

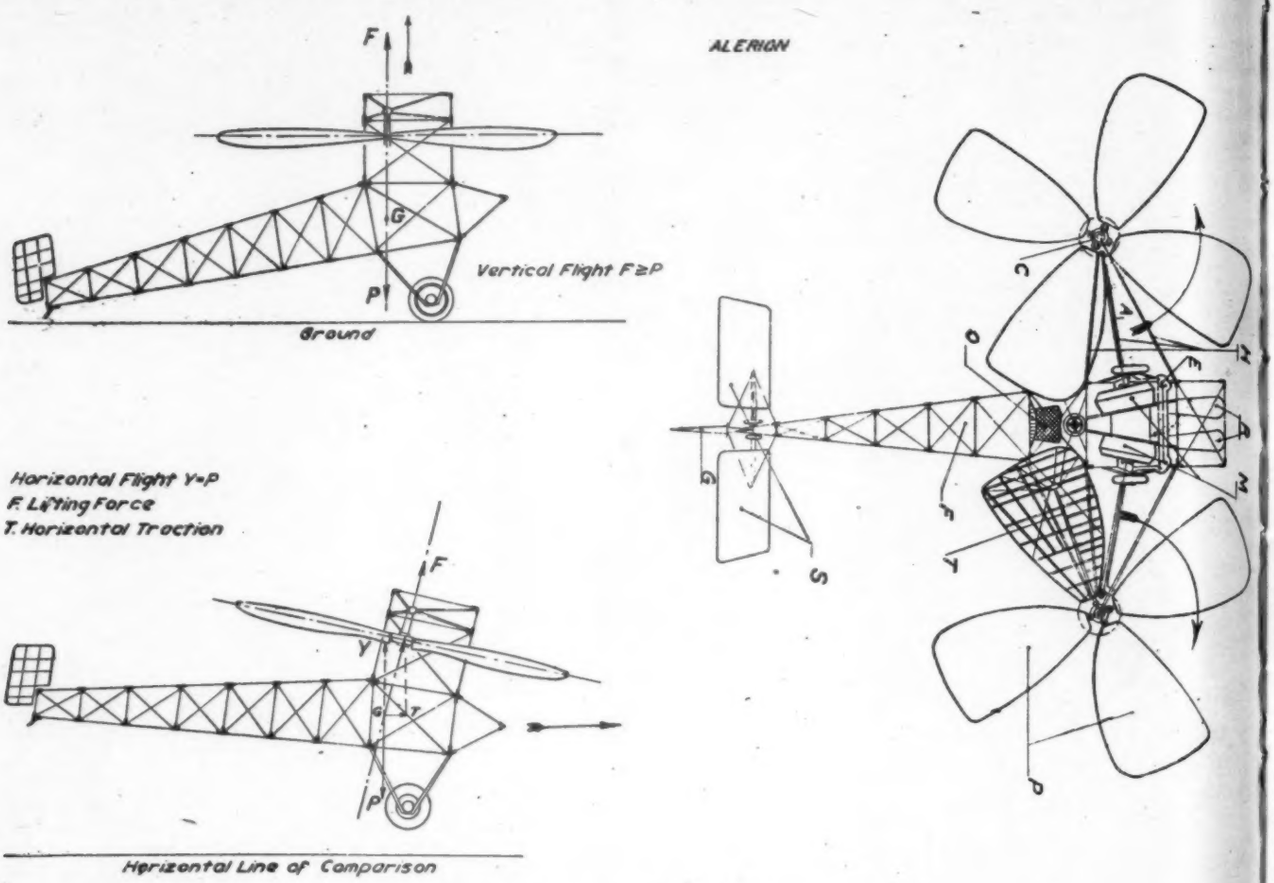
Landing Gear. The landing gear consists of two V-struts braced with crossbars and with bracing wire; two wheels with pneumatic tires are attached to them by an elastic suspension.

Engine Sets. Each set comprises one Le Rhone engine, the characteristics of which are given further on. The main driving shaft, placed inside a tube, forms a single beam and is coupled to the engine by an automatic engaging and releasing device.

This shaft bears a pinion which works a gear wheel, this gear wheel being attached to a crankcase cover which assures the rotary movement of the wings by means of cables fixed to the blades.

An elastic shock absorber composed of bevel gear connected by a special device provides the mechanical connection for the two transmissions.

Warping Device for the Blades. This is composed of a maneuvering organ (control stick and levers), of cables for the transmission of movement, and of a warping gear and control of the blades. For each wing this device consists of a support, four rollers rolling on a bearing cup and four articulated elbow levers acting on the blades of the wings by means of metal cables.



DIAGRAMMATIC DRAWINGS OF THE DAMBLANC HELICOPTER

GENERAL CHARACTERISTICS

Span	50	ft.
Total length	30	ft. 4 in.
Total area of rotating wings	430	sq. ft.
Number of wings	8	
Area of each wing	53	sq. ft.
Width of fuselage	4	ft.
Engines	2 Le Rhone 150	hp.
Area of Stablizing planes	43	sq. ft.
Number of planes	2	
Speed of Rotation of wings	160	r.p.m.
Total weight of machine in flying order, pilot included	2640	lb.
Loading per square foot of lifting surface	8.8	lb.
Area of rudder	10	sq. ft.

CHARACTERISTICS OF THE ENGINES

"Le Rhone" engines 110/120 hp. at 1300 r.p.m.

Consumption Gasoline: 45 liters per hour.
Oil: 8 liters per hour.

Machine: Useful weight carried:
1 pilot
Gasoline for half an hour's flight with 2 engines..about 50 liters.
Oil for half an hour's flight with 2 engines ....about 8 liters.

Experimental Laboratory Test

Object of Test. To determine the correlative values of the powers absorbed by the hub of the propeller, and of the corresponding speeds and thrusts at the fixed point.

Designation of Propeller. According to indications given by the applicant, the propeller presented was a reduced model of one of the two lifting propellers of a new airplane called "The Alerion". This propeller was made of walnut and its chief characteristics were as follows:

Number of Blades	4	
Diameter of Propeller	3.44	ft.
Maximum width of Blades	12	in.

Description of Installation. The propeller was mounted on the dynamometric pendulum of the laboratory which allows the direct measurement of the powers absorbed and of the corresponding speeds and thrusts at the fixed point.

Description of Test. The determinations of the powers absorbed and of the speeds were effected by producing successive thrusts of 3, 8, 13, and 18 kilograms as indicated by the applicant.

For each experiment the speed of the propeller was increased until it gave the proper thrust; when the regime was established, the power absorbed by the hub was noted and the number of revolutions made by the propeller in one minute. For each thrust three measurements were made and the average was taken.

Results. The results obtained are summarized in the following table:

Date of Test .....September 5, 1918.

Designation	Units	——Results——		——Information——	
Thrusts	kg.	3	8	13	18
Number of revolutions of propeller	r.p.m.	480	778	1008	1169
Power absorbed by the hub of the propeller	hp.	0.25	1.03	2.18	3.47

Barometric pressure during the test (brought to 0 deg. Cent.) 756.5 mm. mercury. Surrounding temperature: 22 deg. Cent.

National Southern Air Tournament

The National Southern Air Tournament, which was held at Belleair, Fla., March 26-27-28, aroused deep interest in aerial transport, which promises much toward relieving the entire peninsula of the handicap in communications which it has suffered, and which has greatly retarded its growth. It is estimated that the tournament was attended or witnessed by nearly 50,000 persons, conveyed by motor car, boat and train from the Tampa Bay region and by aircraft from distant parts of the State.

As a result of the tournament, a Committee for the Advancement of Aviation in the South was formed, consisting of Mayor Charles H. Brown of Tampa; Mayor Noel Mitchell of St. Petersburg and Mayor Frank J. Booth of Clearwater; Henry E. Snow, president of the Tampa Board of Trade; Lew Brown, president of the St. Petersburg Board of Trade; George E. Washburn, president of the Clearwater Board of Trade; C. H. Freas, president of the Brookville Board of Trade, and Charles M. Hemphill, secretary of the Clearwater Board of Trade and Secretary of the Committee.

National Government Petitioned

The Aeromarine 14-passenger flying boat "Nina" of the Key West-Havana Line, Capt. Frank Lamb pilot, made a "round-Tampa Bay" flight for the members of the Committe and carried them to Belleair, where they were entertained at luncheon by Earle E. Carley, vice president of the Belleview Hotel. After a number of addresses, in which the advent of commercial flying was welcomed as greatly contributing to Florida's release from inadequate transportation, Mayor Brown of Tampa introduced a resolution which reads in part as follows:—

"BE IT RESOLVED, by the Aeronautical Conference of Southern Municipalities, held in conjunction with the National Southern Air Tournament, that the Legislature of the State of Florida be and it hereby is petitioned to memorialize the Congress of the United States on the urgent necessity for the adoption and observance of a Federal policy of the Air, and be it further

RESOLVED, That such Federal policy of the Air include the enactment of an aerial code, the establishment of air ports, and designation of air routes and the development of signalling and other devices to facilitate safe and regular operation of transport lines."

Large Number of Participants

The National Southern Air Tournament was participated in by the Army and Navy air services, the industry and the Aero Club of America. The Aeromarine Plane and Motor Co., through the Aeromarine West Indies Airways, Inc., and the Aeromarine Engineering and Sales Co., were represented by Major B. L. Smith in command of the "Nina". The Curtiss Aeroplane & Motor Corp. was represented, through half a dozen civilian airplanes, by Charles E. Logan and John L. Moran of the Curtiss Southwest Airplane Co. The Gallaudet Aircraft Corp., the Wright Aeronautical Corp., and the Manufacturers Aircraft Association were also represented.

The star event of the tournament was the Southern Aerial Derby, which was run over a 20-mile triangular course and was won by Lieut. Victor D. H. Strahm on a DH-4B in 51 min. flat. Altogether there were nine starters. Other competitions included landing nearest to the mark, won by Lieut. R. U. Cronau on a Curtiss-Wright; parachute jumping, won by Ray Lockwood; and various exhibitions of aerobatics, formation stunting, etc. The closing feature of the Tournament was a seaplane race, which was run over 10-mile triangular course and was won by Lieut. G. Kirk, U. S. N., on a naval H-16 flying boat, in 41 min. 23 sec. The Aeromarine West Indies flying boat "Nina" sportingly entered the contest with nine passengers on board, and although she was thus 4,000 lb. heavier than the winning H-16, the "Nina" covered the course in 47 min. 46 sec., or at an average speed of 64 m.p.h.

News of the Aero Clubs

Aero Club of Pennsylvania

Through the generosity of a member of the Club, who has requested that his name be withheld for the present, there has been donated a fund of $325 to be applied to aerial tuition of a number of young men. This fund is now in the hands of the Aero Service Corp. of Philadelphia, who maintain a year round school of flying at the official flying field of the Club, near Hatboro, Pa.

It has about been decided to divide this fund into five amounts of $65 each to be given to five young men nominated by aero clubs as candidates to take flying lessons during the early Spring. The seven hours course of the school has lately been reduced and this donation of $65 to five candidates will make it but $250 for the entire training to those fortunate enough to be selected for the course.

It has been suggested by the donor of the gift that the Aero Club of Pennsylvania offer four other aero clubs the privilege of nominating each a member to share in the distribution of the fund. A member of any aero club affiliated with the Aero Club of America is eligible to make application for one of the above mentioned courses. The Aero Club of Pennsylvania is reserving but one of the scholarships for a club member which they will nominate.

American Minister Visits Fokker Works

The American minister to the Netherlands, Mr. Philips, during a recent trip to Amsterdam visited the aerodrome at Schiphol, where he inspected the Fokker commercial airplane which are shortly to be placed in service by the K.L.M. Air Line (Royal Air Transport Co. for Netherlands and Colonies). The K.L.M. line intends to start regular air services between Paris and Amsterdam; Brussels and Amsterdam; London and Amsterdam; Amsterdam, Bremen and Hamburg; Hamburg, Copenhagen and Malmoe; and Danzig and Kovno.

While at Schiphol as the guest of Anthony G. Fokker, Mr. Philips viewed Amsterdam from the air in one of the Fokker cabin monoplanes.

Note

Col. Thurman H. Bane has requested that credit be given to Maj. H. S. Martin, of the Engineering Division, Air Service, at McCook Field, for the preparation of the lecture given at the S.A.E. winter meeting and which appeared in the March 21 issue of AVIATION AND AIRCRAFT JOURNAL. Colonel Bane was unable to attend this meeting on account of illness. It was supposed that this address was prepared by him and delivered, owing to his inability to attend the meeting, by Major Martin.

"Who's Who in American Aeronautics"

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Jerome C. Hunsaker

HUNSAKER, JEROME C., Commander, U. S. Navy; born, Creston, Iowa, 1886; son of Walter J. Hunsaker and Alma L. (Clark) Hunsaker.

Educated: Detroit and Saginaw, Mich., public schools; U. S. Naval Academy; M. S., Eng. D., Mass. Inst. of Tech.

Professional: 1904-1908 U. S. Naval Academy; 1908-1909 Midshipman at sea; 1909-1912, post graduate student of Naval Architecture, Mass. Inst. of Tech.; 1912, Air Shop Sup't., Boston Navy Yard.

Aeronautical Activities: 1913, abroad studying Aerodynamics; 1914-1916, Mass. Inst. of Tech., Instructor in Aeronautical Engineering and Research in Aerodynamics. Introduced the application of the results of aerodynamic research in the design of American aircraft, first by translating and making available Eiffels' work and later by building the first wind tunnel at the Massachusetts Inst. of Tech. whose original research was conducted and the results given to our builders and whose group of engineer graduate students were trained as aeronautical engineers. When the U. S. entered the war, these aeronautic engineers were placed in charge of the technical services of both the Army and Navy as well as the air service A. E. F. While in charge of the aircraft division of the Bureau of Construction and Repair of the Navy Department had responsibility under the Chief Constructor's direction for the Naval aircraft program; designed the first modern airship produced in the United States, as well as the C & D class Navy airships; with Westervelt and Richardson designed the NC flying boats.

War Service: 1916-1921, in charge Aircraft Division, Bureau of Construction and Repair, Navy Dept.; Member, joint Army and Navy Technical Board 1917 to frame Aircraft Program.

War Honors: Navy Cross.

Books: Translation of Eiffels' "Resistance of the Air"; "Stable Biplane Arrangements"; "Aerodynamic Properties of the Triplane"; "Aeroplane Stability".

Member: American Society Naval Architects and Marine Engineers; American Physical Society; Hon. Fellow, Royal Aeronautical Society of Great Britain; U. S. Naval Institute; Army and Navy Club.

Present Occupation: In charge Aircraft Division, Bureau of C and R, Navy Dept.

Address: Navy Department, Washington, D. C.; home, 3515 Lowell St., Washington, D. C.

Augustus Post

POST, AUGUSTUS, Aeronautical Expert; born, Brooklyn, N. Y., 1873; son of Augustus T. Post and Mary E. (Austin) Post.

Educated: Brooklyn Polytechnic Institute; B. A. 1895, Amherst College; Harvard Law School.

Professional: Banking with E. D. Shepard & Co., 1896-1900; Guy Bates Post Co., 1915-1917; Automobile Activities, 1898-1905.

Aeronautical Activities: Aero Club of America, (Charter) Incorporator 1905, Secretary and Treasurer; Flew at Hammondsport, N. Y. 1910; Sheepshead Bay, N. Y.; Squantum Meet, Boston, Harvard Aeronautics Society; Hawthorne Track Meet, Chicago, Ill.; Cleveland, O.; New Orleans, La.; Mobile, Ala.

War Service: Organized Foreign Service Committee of the Aero Club of America, Paris 1917.

Books: Curtiss Aviation book.

Member: Aero Club of America (Charter); American Automobile Association (life member).

Present Occupation: Secretary, Aero Club of America.

Address: 11 E. 38th St., New York.

Milton F. Davis

DAVIS, MILTON F., Colonel, U. S. Army (retired); born, Minnesota, Nov. 15, 1864; Son of Evan R. Davis and Julia A. (Ryder) Davis.

Educated: Public schools, Oregon; U. S. Military Academy, West Point.

Professional: 2nd Lieut. 1st Lieut. Captain of Cavalry, Major, Judge Advocate General's Department. Engineer Officer, Sierra Forest Reservation; explored Grand Canon; Adjutant General, 3d Brigade, P. I. Insurrection; Sec'y., Staff College; Gen. Staff. Aide to Chief of Staff; Colonel, Signal Corps.

Aeronautical Activities: Chief of Training, Air Service 1918; Chief of Staff, Air Service (Executive) 1918;

Flying Training: Finished "Dual Instruction."

Member: The Lambs, The Explorers, Camp Fire of America, Army and Navy (N. Y.), Army and Navy Club (Wash.).

Present Occupation: Commandant of Cadets, New York Military Academy.

Address: Cornwall on Hudson, N. Y.

Richard Evelyn Byrd, Jr.

BYRD, RICHARD EVELYN, JR., Lt. Comdr, U. S. Navy; born, Winchester, Va., Oct. 25, 1888; son of Richard Evelyn Byrd, Sr. and E. (Balling) Byrd; married, Marie O. Ames, Jan. 20, 1915.

Educated: Shenandoah Valley Military Academy of Winchester, Va.; Virginia Military Institute; University of Va.; Naval Academy (Graduate), B. A. Harvard; Graduated Naval Academy in 1912 (previous to this had 2 years at S. J. M. A. and 2 years at V. M. I.).

Aeronautical Activities: Came into aviation Aug. 1917, Pensacola; started first night flying over water, first out of sight of land flying over water; commanding U. S. air forces of Canada, Halifax and North Sydney. In charge navigational preparations, Translantic Flights, first two legs; after flight Ass't to Director of Naval aviation.

Flying Rating: Naval Pilot.

War Service: Pensacola, Commanding U. S. Air forces of Canada from July 1918 until Armistice.

War Honors: Silver Star, Aviator's Medal of Merit.

Books: Booklet on "Navigation of the Air."

Member: Army and Navy Club (Wash.); Chevy Chase (Wash.); Racquet Club (Phila.).

Present Occupation: Assistant to Director of Naval Aviation.

Address: Navy Dep't., Washington, D. C.; home, 2400 10th St. Washington, D. C.

William Byington Wynn

WYNN, WM. BYINGTON, Captain, U. S. Air Service; born, Brandon, Miss., Jan. 26, 1893; son of Josephus Wynn and Minerva C. Wynn; married, Gormaine Soudee, Dec. 23, 1918.

Educated: Brandon High School.

Professional: Farmer until 18 years of age; Mercantile business, 1912-1915; Enlisted in 4th U. S. Infantry (Reg.) Jan. 28, 1915; Commissioned 2d Lieut., Nov. 26, 1916.

Aeronautical Activities: Arrived in France, June 26, 1917 with 1st Division; sent to French Aerial Observer's school, Sept. 26, 1917; Graduated Dec. 1, 1917; U. S. Instructor Aerial Observation at Amanty, France, Dec. 1, 1917 to Jan. 15, 1918; Instructor Aerial Observation Tours, France, Jan. 20 to Sept. 15, 1918.

Flying Rating: R. M. A. July 1918; Aerial Observer, Dec. 1917.

War Honors: Citation by Gen. Pershing for bravery in St. Mihiel battle, Sept. 13, 1918.

Books: President of Board of Officers to write Observation Manuals for the A. E. F., March 1 to June 1, 1919.

Present Occupation: Capt. U. S. Air Service.

Address: Carlstrom Field, Arcadia, Fla.

George Montague Williams

WILLIAMS, GEORGE MONTAGUE, Airplane Manufacturer; born, Nanaimo, B. C. Canada, April 6, 1890; son of George Williams and Elizabeth H. (Stannard) Williams; married, Gwendoline Ware, Jan. 26, 1914.

Educated: Trinity College School, Port Hope; Soo Technical Institute.

Professional: 1909-1911, Ass't. Engineer, Lake Superior Power Co.; 1911-1914, Ass't. Chief Engineer, The H. E. Talbott Co.; 1914-1916, Ass't. Vice-President, The Dayton Metal Products Co.; 1916-1919, Ass't. to President, The Dayton Wright Airplane Co.; 1919 General Manager, Dayton Wright Co., Dayton, Ohio.

Aeronautical Activities: Continuous airplane construction since 1916.

Member: Society Automotive Engineers (Dayton Section); Engineers Club of Dayton; Aero Club of America.

Present Occupation: General Manager, The Dayton Wright Co.

Address: Dayton Wright Co., Dayton, O.; home, Oakwood, Dayton, O.

Frederick Trubee Davison

DAVISON, FREDERICK TRUBEE, Law Student; born, New York, N. Y., Feb. 7, 1876; son of H. P. Davison and Kate T. Davison; married, Dorothy Peabody, April 16, 1920.

Educated: Groton School, Groton, Mass.; B. A. Honoris Causa, Yale, class 1918; Columbia Law School, class of 1922.

Aeronautical Activities: Learned to fly 1916; flew till July 28, 1917.

War Service: Joined Naval Flying Corps, March 24, 1917; Sick leave from July 28, 1917 to Dec. 24, 1918.

Member: Aero Club of America; University Club; Yale Club; National Republican Club.

Present Occupation: Law Student.

Address: 430 West 116 St., New York City.

George Edward Lovell, Jr.

LOVELL, GEORGE EDWARD, JR., Me... Air Service; born, Buffalo, N. Y., Aug. 10, 19... son of George Edward Lovell, Sr. and Edith L... Lovell; married, Marjorie Victoria Blackl... July 15, 1916.

Educated: Grammar Schools, Buffalo, N. Y.; Chattanooga, Tenn. Grammar School; Co... High School, Buffalo, N. Y.; U. S. Military A... demy, West Point, N. Y., Class of 1913; Co... missioned, U. S. Army, June 12, 1913, 24 L... Cavalry.

Professional: 2nd Lt. 9th U. S. Cav. ... 1913 to Nov. 1915; 7th Cav. Nov. 1915 ... March 1916 (Service Mexican Border); Stu... Aviation School, San Diego, Calif., March 15 ... Dec. 1, 1916; first Aero Squadron, Dec. 1, 19... to March 1, 1917 (Punitive Expedition into M... co); First Lt. Cav. May 15, 1916; Capt. C... May 15, 1917; Major, Cav. July 1, 1920; Tr... ferred to Air Service as Major July 1, 19... overseas service Sept. 15, 1918 to May 15, 19... Stations, Aviation School, Tours, France; Fi... American Army, A.E.F.

Aeronautical Activities: Student, Aviat... School, San Diego, Calif., March 1, 1916 to De... 1, 1916; First Aero Squadron, Dec. 1 to M... 1, 1917; Kelly Field, 5th Aero Squadron, Of... in charge flying until Nov. 1, 1917; C. O. Tal... ferro Field, Ft. Worth, Tex. until Sept. 1, 19... Overeas to Aviation School, Tours, France, ... Executive Officer, until Jan. 15, 1919; First Am... ican Army, as Executive to Army A. S. Com... der, until May 1, 1919; Adj., Rockwell Field, ... July 29, 1919; C. O. Park Field, Tenn. to May ... 1920; Commanding A. S. Activities, Camp D... ning, Ga. to date.

Flying Rating: Pilot, Aero Club of Ameri... July 1, 1916; Junior Military Aviator, M... 19, 1916; Military Aviator, Nov. 19, 1919; Ai... plane Pilot, (New rating) Oct. 5, 1920.

War Service: Regular Army during war; w... service all in the Air Service, April 4, 1917 ... Nov. 11, 1918.

Member: Air Service Association.

Present Occupation: C. O. Air Service Acti... ties, Camp Benning, Ga.

Address: Camp Benning, Ga., Columbus, G...

Philip A. Carroll

CARROLL, PHILIP A., Lawyer; born, Bal... more, Md., May 10, 1879; son of John Lee Ca... roll and Mary Carter (Thompson) Carroll.

Educated: A. B., L L. B., Harvard Univers...

Professional: Lawyer.

Aeronautical Activities: 1915 began flyi... 1916 Governors Island Aviation School; 191... Service U. S. Army, A. E. F. to 1919.

Flying Rating: Reserve Military Aviator.

War Service: Service with A. E. F., Aug. 2... 1917 to Feb. 1, 1919; rank Lt. Col.

Member: Aero Club of America.

Present Occupation: Lawyer.

Address: 55 Wall St., New York City; hom... 142 East 30th St., New York City.

Holden Chester Richardson

RICHARDSON, HOLDEN CHESTER, Co... mander, U. S. N.; born, Shamokin, Pa., Dec. ... 1878; son of William A. Richardson and Eliz... J. (Dotty) Richardson; married, Margaret Jos... July 1908.

Educated: Shamokin High School, 1896; Nav... Academy, 1901; M. I. T., 1906; M. S., 1907 (N... I. T.).

Professional: Naval Officer at sea 1901-190... M. I. T. 1904-1907; 1907-1909, Ass't. Sup't. Co... struction, Newport News; 1909-1911; Naval Co... structor, Philadelphia Navy Yard 1911-1915; Bu... eau of Construction and Repair, Aviator, 191... 1917; Construction Officer, Naval Air Stati... Pensacola, Fla., 1917-1919; Supt. Construct... Bureau, Buffalo, N. Y., 1919, Chief Engine... Naval Aircraft Factory, Philadelphia, 1919-192...

Aeronautical Activities: Continuous ... March 1912 at San Diego, Annapolis, Hammon... port, Pensacola, Washington, Buffalo, Rockaw... Philadelphia; Designed hulls for N. C. transatla... tic seaplanes; Tested all N. C.'S and assisted ... planning Transatlantic Flight; Pilot on Tran... atlantic Flight.

Flying Rating: Naval Aviator No. 13, U. S. ... Navy.

War Honors: Navy Cross, Officer of the Tow... and Sword, Portugal.

Member: Army and Navy Club, (Wash.); ... Naval Architects and Marine Engineers.

Present Occupation: Chief Engineer, Naval ... Aircraft Factory, Philadelphia.

Address: Navy Yard, Philadelphia; home 100... Marlyn Road.

Bruce Gardner Leighton

LEIGHTON, BRUCE GARDNER, Lt. Com., 1892; son of James Gardner Leighton and Maria (Ackley) Leighton; married, Ethel Ruth Major, June 30, 1915.

Educated: Tunkhannock High School; U. S. Naval Academy, Class of 1913.

Professional: U. S. Navy since 1913.

Aeronautical Activities: Began flight training, Pensacola, April 1, 1916; Naval aviator April, 1917, Naval Aviator No. 40; Charge of Motor overhaul shops, Pensacola Air Station, April 1917 to January 1918; January 1918, temporary duty in connection with fitting out U. S. Navy Air Service at Killingholme, England; May to December 1918, at Killingholme as executive officer and squadron Commander, and Commanding officer from Nov. 1st until armistice; North Sea Anti Submarine patrol and reconnaissance; Jan. 1919, detailed as squadron commander of flying boat squadron Air Force, U. S. Atlantic Fleet, continuing until Dec. 1, 1920; during this period squadron maintained position with fleet at all times, cruising two years with fleet in Atlantic waters and in Caribbean waters, operations extending from Newport, R. I. to Kingston, Jamaica, Virgin Islands and practically all ports between these limits; developed fleet aircraft tactics, search and reconnaissance, spotting for gun fire, bombing, etc.; squadron cruised more than 25,000 miles during this time; Bureau of Engineering, Dec. 1920 to present date, in charge of heavier-than-aircraft power plant section, aviation division.

Flying Rating: Naval Aviator No. 40, April 17, 1917.

Present Occupation: In charge of heavier-than-aircraft power plant section, Bureau of Engineering, Navy Department.

Address: Bureau of Engineering, Navy Dept., Washington, D. C.; home, 2034 Allen Place, N. W., Washington, D. C.

Albert Lee Sneed

SNEED, ALBERT LEE, Major, Air Service; born, Conway, Arkansas, April 24, 1884; son of Charles Robert Sneed and Vena (Lee) Sneed.

Educated: Conway and Bortonville, Arkansas; 1½ years, University of Arkansas; U. S. Military Academy, 1904 to 1908.

Aeronautical Activities: C. O., U. S. S. M. A., Mass. Inst. Tech., Oct. 1917 to April 1918; Pilots School, Rockwell Field, San Diego, Calif., May 1, 1918 to Aug. 15, 1918; C. O. Love Field, Dallas, Tex., Aug. 1918 to May 1919; O. C. A. S., Washington, D. C. May 1919 to Nov. 1919; Student Engr. Div., Dayton, O., Nov. 1919 to Oct. 1920; Air Officer 3rd Corps Aera, Nov. 1920 to present date.

Flying Rating: Junior Military Aviator; Airplane Pilot.

War Service: Air Service Officer, 1917-1918.

Member: Army and Navy Club (Wash.); Baltimore Country Club; American Flying Club of Baltimore.

Present Occupation: U. S. Army Officer, Air Service.

Address: Ft. Howard, Md., Baltimore, Md.; home, Baltimore Country Club, Baltimore, Md.

Clifford Burke Harmon

HARMON, CLIFFORD BURKE, Real Estate; born, Urban, O., July 5, 1868; son of William R. Harmon and Mary (Wood) Harmon.

Educated: Public Schols; private tutors.

Professional: Wood, Harmon & Company, Real Estate; Clifford B. Harmon & Company, Real Estate; Oil Interests.

Aeronautical Activities: Ballooning twenty years; Flying 1909; Holder of Duration record, 48 hours 26½ minutes in the air, 1909.

Flying Rating: First man to fly Long Island Sound, 1910, World's record, 2 hours 3½ minutes.

War Service: Major in Air Service; Service Overseas.

Member: Flying Club; Royal Flying Club of London; Many social clubs.

Present Occupation: Real Estate and Oil.

Address: 51 East 42d Street, New York City; home, Harmon-on-Hudson, New York.

Walter E. Benjamin

BENJAMIN, WALTER E., Representative, U. S. Shipping Board; born, La Crosse, Wis. Feb. 6, 1891; son of Richard Eugene Benjamin and Josephine (Wheeler) Benjamin; unmarried.

Educated: Public schools, La Crosse.

Aeronautical Activities: Special Gosport Cadet, Brooks Field; First Gosport cadet graduated in U. S.; Instructor and Ass't. Engineer Officer, Bolling Field.

Flying Rating: R. M. A.

War Service: 2d Lieutenant, Air Service.

Present Occupation: Traveling Representative U. S. Shipping Board.

Address: Masonic Temple, La Crosse, Wis.

Harvey Meredith Pugh

PUGH, HARVEY MEREDITH, Executive; born, Lincoln, Ill., Dec. 25, 1894; son of Charles H. Pugh and Edith P. Pugh; married, Edith P. Jones, 1893.

Educated: Minneapolis and Denver graded Schools; University of Denver, Colo., one year and University of Colorado, three years.

Professional: Manager, Teachers Employment Agency before the war and afterwards to date; Same from graduation from University.

Aeronautical Activities: Ground School, Berkeley, Calif., Nov. 6, 1917; Rockwell Field, Calif., Jan. 1918 to Aug. 1918; March Field, O. I. C. 2nd Solo, Aug. 1918-Aug.1919; had charge of night flying and second solo and first solo as instructor during the time of my commission, July 1918.

Flying Rating: R. M. A. while in service; now 1st Lt. Sig. R. C. A. S. Flying.

War Service: Nov. 6, 1917 as cadet to Aug. 16, 1919; Instructor, 2d Lieut.

Member: Sec'y., Allied Fliers' Club, Berkeley, Calif.

Present Occupation: Manager, Employment Agency.

Address: Berkeley Bank Bldg., Berkeley, Calif.; home, 2615 Virginia St., Berkeley, Calif.

Howard C. Davidson

DAVIDSON, HOWARD C., Major, Air Service; born, Wharton. Texas, Sept. 15, 1890; son of John C. Davidson and Lily (Carleton) Davidson.

Educated: Wharton High School; Texas Agricultural and Mechanical College; Graduate U. S. Military Academy, 1913.

Aeronautical Activities: Flying training, San Diego, Calif., Jan. to Sept. 1916; 1st Aero Squadron, Mexican Punitive Expedition, Columbus, New Mexico, Sept. 1916 to March 1917; San Antonio 3rd Aero Squadron March to May 1917; Cornell Ground School, May to Oct. 1917.

Flying Rating: Junior Military Aviator, Sept. 16, 1916; Military Aviator, Sept. 16, 1919; Airplane Pilot, Oct. 5, 1920.

War Service: Training Section, A. E. F., Paris, Tours and 2nd A. I. C., Oct. 1917 to Sept. 1918; Corps Air Service Officer, 7 Corps, Sept. 1918 to April 1919; student, University of Paris, April 1919 to July 1919; returned from overseas, Aug. 1919.

Present Occupation: Supply Officer, McCook Field, Dayton, Ohio.

Address: McCook Field, Dayton, Ohio; home, R. F. D. No. 3, Bryan, Tex.

Samuel Wesley Stratton

STRATTON, SAMUEL WESLEY, Physicist; born, Litchfield, Illinois, July 18, 1861; son of Samuel Stratton and Mary B. (Webster) Stratton.

Educated: High School; B. S., University of Illinois, 1884; D. Sc., Pittsburgh, 1903; Eng. D., 1903; D. Sc. Cambridge, 1908; D. Sc., Yale, 1919.

Professional: Instr. Math. and Physics, Illinois, 1886-1889; Asst. Prof. Physics, 1889; Prof. Physics and Elec. Eng., 1889-1892; Asst. Prof. Physics, Chicago, 1892-1895; Assoc. Prof., 1895-1898; Prof., 1898-1901; Director, Bureau of Standards from 1901; Member, Int. Committee on Weights and Measures; U. S. Delegate, Int. Elec. Congresses, St. Louis 1904, London, 1909.

Aeronautical Activities: Secretary and member National Advisory Committee for Aeronautics since 1913.

Member: National Academy of Sciences; American Association for Advancement of Science; Amercian Physical Society; American Institute of Electrical Engineers; American Philosophical Society; Washington Philosophical Society; National Research Council; American Society of Mechanical Engineers; American Society of Testing Materials.

Present Occupation: Director, Bureau of Standards.

Address: Bureau of Standards, Washington, D. C.

Thomas George Lanphier

LANPHIER, THOMAS GEORGE, Major, U. S. Air Service; born, Lohrville, Iowa, April 16, 1890; son of John J. Lanphier and Katherine Carey Lanphier; married, Janet I. Cobb, Feb. 1, 1915.

Educated: Lohrville High School; Creighton University, Omaha, Neb.; West Point Military Academy graduate, June 12, 1919.

Professional: Student and Army Officer.

Aeronautical Activities: Flying since Aug. 1918; Trained at Issoudon, France; was Executive Officer, Officer in charge of training and Commanding Officer Issoudon, France.

Flying Rating: Junior Military Aviator, Dec. 10, 1918.

War Service: Served with 8th Machine Gun Battallion, 3rd Division on Marne in Aisne-Marne Defensive.

Member: Aero Club of America; Bohemian Club, (San Francisco).

Present Occupation: Major U. S. Air Service.

Address: Mitchel Field, Garden City, N. Y.; home, 2533 Cass St., Omaha, Neb.

Harrison Henry Cocke Richards

RICHARDS, HARRISON HENRY COCKE, Major, Air Service; born, Petersberg, Va., April 26, 1890; son of Walter B. Richards and Mary M. C. Richards; married, Landonia Brock, June 14, 1916.

Educated: Public School and High School, Front Royal, Va.; Randolph-Macon Academy, Front Royal, Va.; U. S. Military Academy, June 13, 1911.

Professional: Cadet U. S. M. A., June 15, 1907 to June 13, 1911; Commissioned 2d Lt., June 13, 1911 to June 30, 1916; 1st Lt., July 1, 1916 to May 15, 1917; Captain Regular Army, May 15, 1917 to June 30, 1920; Major, July 1, 1920 to date; Major, National Army, June 10, 1918 to May 20, 1920.

Aeronautical Activities: Began training North Island, San Diego, Calif., Sept. 10, 1915; Pilot's license, March 1916.

Flying Rating: Junior Military Aviator, Aug. 1918.

War Service: U. S. Army, Regular, April 1917 to date; duty at Kelly Field, from April to July, 1917; Commanding Officer, School Military Aeronautics; Georgia School of Tech., Atlanta, Ga., July 4, 1917 to Oct. 24, 1917; Dept. Air Service Officer, S. E. Dept., Nov. 1917 to May 1918; Instruction at Rockwell Field, June 1, 1918 to Sept. 12, 1918; Officer in charge Training, Gerstner Field, Sept. 12 to Oct. 30, 1918; Hoboken Overseas Orders, Nov. 7, 1918.

Member: Cavalry Association; Air Service Association; Army & Navy Club (Wash.)

Present Occupation: Commanding officer, Love Field, Dallas, Texas.

Address: Riverton, Warren County, Va.

Douglas Campbell

CAMPBELL, DOUGLAS, Executive; born, San Francisco, Calif., June 7, 1896; son of Wm. Wallace Campbell and Elizabeth B. Campbell.

Educated: Grammar School at Mt. Hamilton, Calif., 1901-1909; The Hotchkiss School at Lakeville, Conn., 1909-1913; A. B. 1917, Harvard University.

Professional: With W. R. Grace & Co., New York.

Aeronautical Activities: Trained at Issoudin, France, Oct. 15, 1917 to Jan. 25, 1918; trained at Cazaux, France, Jan. 28 to Feb. 15, 1918; Flight Comdr., 94th Aero Squadron at front, March 8 to June 5, 1918, when wounded; 7 victories, First American Ace.

Flying Rating: Military Aviator.

War Honors: Croix de Guerre, 3 citations, first citation, April 15, 1918; Chevalier, Legion of Honor; Distinguished Service Cross with three oak leaves.

Member: Harvard Club of New York City; Aero Club of America.

Present Occupation: Secretary to the President, W. R. Grace & Co.

Address: 7 Hanover Street; home, 45 East 55th St., New York City.

Adlai Howard Gilkeson

GILKESON, ADLAI HOWARD, Major, U. S. Army; born, Lansdale, Pa., Jan. 25, 1893; son of Andrew Gilkeson and Jane (O'Neal) Gilkeson.

Educated: Public and High Schools, Sellersville, Pa.; U. S. Military Academy, West Point, N. Y.

Professional: Army Officer.

Aeronautical Activities: Entered Aviation Section, Signal Corps, Aug. 1916; held second place, New York-Toronto Air Race, 1919.

Flying Rating: Junior Military Aviator.

War Service: Princeton Ground School Commanding Officer, July to Sept. 1917; duty at Chanute Field, Ill., Sept. 1917 to Jan. 1918; Rich Field, Texas, Jan. to April 1918; Wilbur Wright Field, O., April to Aug. 1918; Chanute Field, Aug. 1918 to Jan. 1919.

Present Occupation: Executive Officer, Carlstrom Field, Arcadia, Fla.

Address: Sellersville, Pa.

Charles Theodore Jewell

JEWELL, CHARLES THEODORE, Commander (ret.) U. S. N.; born, Annapolis, Md., Feb. 26, 1872; son of Theodore Frelinghuysen Jewell and Elizabeth Lindsay (Poor) Jewell.

Educated: Coddington Grammar School; Rogers High School, Newport, R. I.; U. S. Naval Academy, Class of 1892.

Professional: Active Naval service until July 1, 1910, when was placed on retired list; Remained inactive until March 2, 1917, when reported for duty at Naval Observatory.

Aeronautical Activities: While in charge of Navigational instruments at Naval Observatory, had charge also of aerial navigational instruments; in May 1918, the Department of Aeronautical Instruments was formed and was placed in charge with no other duties.

Present Occupation: Duty at Naval Observatory.

Address: U. S. Naval Observatory, Washington, D. C.

Airplane Efficiency in Public Transportation

By H. White-Smith*

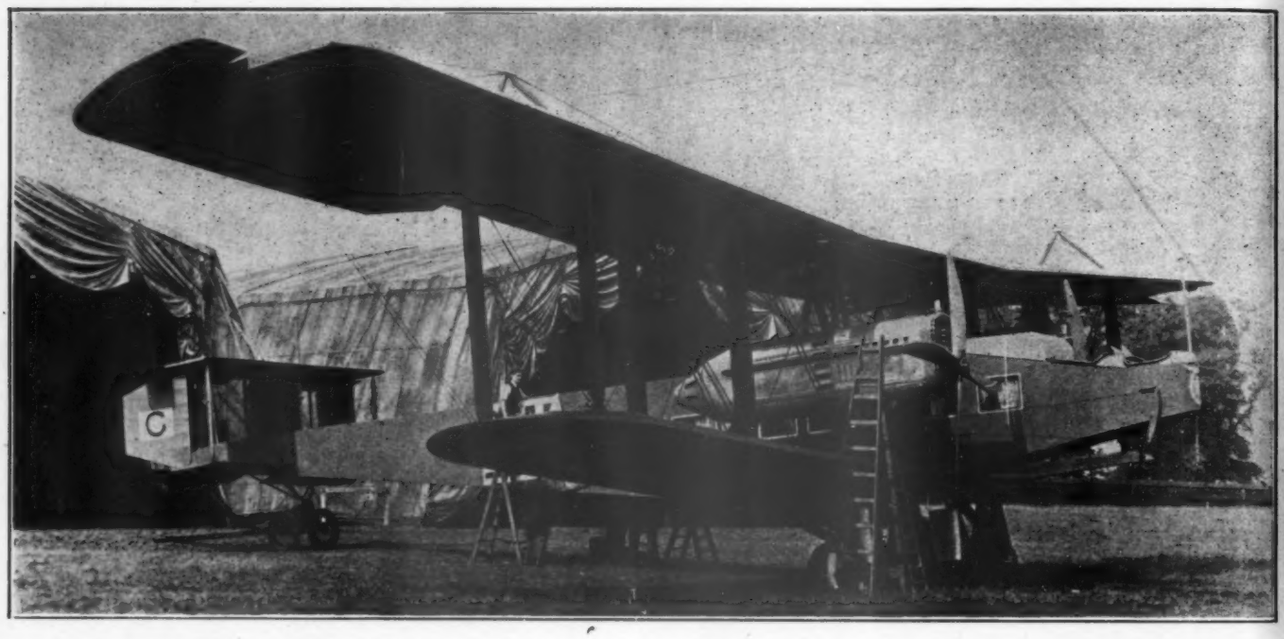
Chairman, Society of British Aircraft Constructors

When considering aerial transport in relation to or in comparison with other forms of transport it is useful to consider in the first place of what efficiency in transport consists. We find that the most efficient form of transport is a combination of the following qualities:—(1) Speed, combined with a capacity for covering distance. (2) The ability to convey merchandise, mails or passengers from one point to another without constant handling or changing. (3) Mobility. (4) Safety and reliability. (5) Economy of working, producing the lowest possible price for the amount of service rendered.

Given these qualities as being those necessary for efficient transport services, I think we may with safety say that the airplane gives the greatest promise of efficiency of all modern transport. Let us examine these points in the order in which I have stated them:—

London to	Distance In Miles	By Express train & Boat	By Air day Flying 12-hr. day	Saving In Time
		(hours)	(hours)	(hours)
Paris	240	9	2¼	6¾
Marseilles	700	22	8	14
Brussels	210	10	2	8
Amsterdam	260	13½	2½	11
amburg	410	25	5½	19½
Copenhagen	560	47	7½	39½
Berlin	560	25	7½	17½
Prague	700	36	9	27
Madrid	950	44	11½	32½
Rome	1150	43	26½	16½

Note—The time taken by train and boat are the approximate times taken by existing express services.



HANDLEY PAGE 10-PASSENGER CABIN AIRPLANE USED ON THE LONDON-PARIS SERVICE

Speed

As far as speed is concerned, the airplane—and I use this term in a generic sense, including the amphibian and seaplane—has on outstanding advantage over other forms of transport. At the present stage of development we do not think of aerial transport except in terms of 100 m.p.h. By this I mean what is termed cruising speed, and not the full speed of the aircraft, which approximates to 125 m.p.h. For the time being a speed of 100 m.p.h. is probably the most economical to adopt, but there is no reason why, in the future, we should not employ cruising speeds of 130 m.p.h. with top speeds of 160 to 180 m.p.h.

No other form of transport can in any measure approach these startling speeds. To enable you to appreciate the advantage in speed which the airplane has over other modes of transport I have prepared a short table showing the times taken by the express train and boat to reach the principal towns in Europe, and also the time in which the airplane could complete the journey. The airplane times are based on an average flying speed of 100 m.p.h., allowing half-an-hour's delay to change machines at each stopping place.

The air routes are all practical, and in fact those to Paris, Brussels, Amsterdam, Hamburg, Berlin, Copenhagen and Prague should be in operation this year either by British or foreign transport companies.

On comparatively short distances, such as to Paris, Brussels and Amsterdam, there is no difficulty in travelling from point to point in a few hours, but to some of the places, such as Marseilles, Hamburg, Berlin, Copenhagen, the distance could also be covered for certainly nine months of the year in the day. For the greater distances, such as Rome, Bucharest, under present conditions a stop would have to be made when darkness fell and a start made by daybreak next day, with a consequent loss of much time and efficiency of service. If night flying is developed on right lines the efficiency and possibilities of airplane services will be vastly improved, but even on the figures of daylight flying only it will be seen that in the conveyance of merchandise of a light character, of mail matter and documents and newspapers, the saving of time by aircraft is so considerable as to, in all cases, justify the use of this mode of transport. I think you will agree, therefore, that, judged on speed alone, the airplane is the most efficient mode of transport.

Ability to Convey Merchandise, Mails, or Passengers without Constant Handling or Changing

It is obvious the less handling there is on any consignment of goods the more you reduce handling charges, combined with

* Paper read at the Efficiency Exhibition, London.

the more rapid movement of a greater amount of goods; therefore any form of transport which reduces handling is making for efficiency. The airplane here scores a considerable advantage over other forms of transit. Take a parcel being sent from London to Paris. First of all it is placed in the van, from the van it is moved into the train, from the train to the boat, from the train again, then to another van, then to its destination. By air the parcel would be placel in the van, then into the airplane, and again into a van and to the destination, a saving of at least two handlings. To business houses whose goods are at all liable to damage the reduction of handling will be apparent, as it means less liabilty to damage, fewer charges for handling and greater safety.

Another feature which is of real importance at the present time is the almost complete elimination of the risk of pilferage. This advantage of the air is apparent, and I may here mention that the rate of insurance against all risks for a parcel despatched by air is anything from one-third to one-sixth of the rate when sent by land and sea. It may be objected that, on the longer routes, such as to Rome and Madrid, the relay system of aircraft would be operated, and that there would be consequent transference of the goods and passengers at various stages of the journey; but even so, these stages would be of considerable length, probably not less than 400 miles, with consequently infrequent changes, and part of the standard equipment of goods-carrying aircraft would be a type of specially made "containers" which would be rapidly transferred from one airplane to another; the handling would be in bulk and the risk of pilferage from these sealed containers practically nil.

Mobility

Another important asset of the airplane is its mobility. The only factor controlling mobility is the necessity of using aerodromes for departure and landing. The operators of aircraft can, however, place their landing grounds at any desired point to serve great centers of population, or with equal facility, the small village.

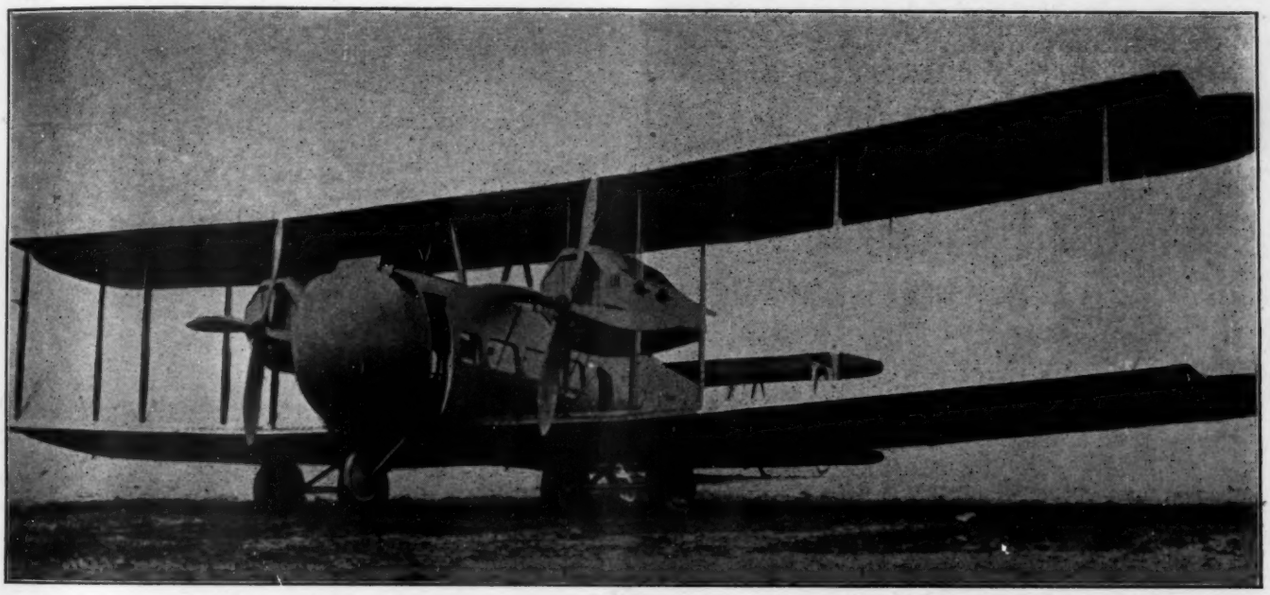
The value of this quality of mobility will be most apparent, however, in our great dominions and colonies and the other countries of wide distances. In the colonies you have no such network of railways or roads as exist in Great Britain and Europe. There are great open spaces untracked by rail or roads, and it is in these places that the mobility of the airplane will prove of the greatest service. In these places the land for aerodromes will be cheap and they will be easy of construction.

In reviewing this question of mobility the development of the amphibian calls for our careful consideration, for operating as it does on either sea or land, there is a great advantage as regards the place of its departure or landing. If land aerodromes are not available, probably the sea or river would be available, and its mobility is therefore correspondingly greater.

Safety and Reliability

The next question we have to consider in relation to efficiency of transport is that of safety, and linked with it, reliability. Although there is but a short history and experience behind the development of aerial transport, it has already an excellent record for safety and reliability. While accidents do happen to aircraft, and some of them serious, yet the record of commercial flying is surprisingly good. For 17 months up to Sept., 1920, per 1,000 people carried last year, the percentage of fatal accidents for aircraft was .08, or one in 12,500 and the injuries .15, or one in 6.500 people.

The chief difficulty to be solved is that of fog; air navigation instruments and wireless telephones are being developed, and directional wireless improved, permitting of the navigation of aircraft out of sight of landmarks and guides; equally well above the clouds or in a fog; engines are being improved and developed for commercial work; stability is being studied, so that there will be a steady progress in safety and also in reliability of aerial services.



VICKERS-VIMY 12-PASSENGER CABIN AIRPLANE OF THE INSTONE AIR LINE, FLYING ON THE LONDON TO PARIS SERVICE

Economy of Operation

We next come to the very important question of the cost of operation and its effect on the efficiency in transport.

As regards economy of working in the air, the war experience was purely retrograde, and so far from helping to develop economy, that quality had to be completely disregarded, and the first and only consideration was necessarily efficiency in air fighting. We still have hardly shaken off this war influence, but with the past two years there has been a steady improvement in the design of commercial aircraft, productive of economy. War machines such as the Airco 9 and the "Bristol" Fighter cost to operate per ton mile about 8 shillings, whereas today there are machines available, such as the Airco-18, the Handley Page W.8, and the "Bristol" 10-seater, by which the cost has been reduced to about 3 shillings 6 pence, that is, less than half.

In considering the question of economy in operation we must have regard to the effect of speed. In all forms of transport there are speeds which are economical, and any increase on these speeds means increase in cost of operation. The same applies in the air. The economical air figure is the high one, to which I have already referred, of about 100 m.p.h.

To examine the comparative cost of transport by air, land

and sea, I have set out a short table which shows what it will cost to transport a ton of cargo on two journeys, one short, London to Paris, (240 miles), the other longer, London to Marseilles (700 miles).* I have also the cost per passenger and the time occupied by the various modes of transport.

LONDON TO PARIS, 240 MILES

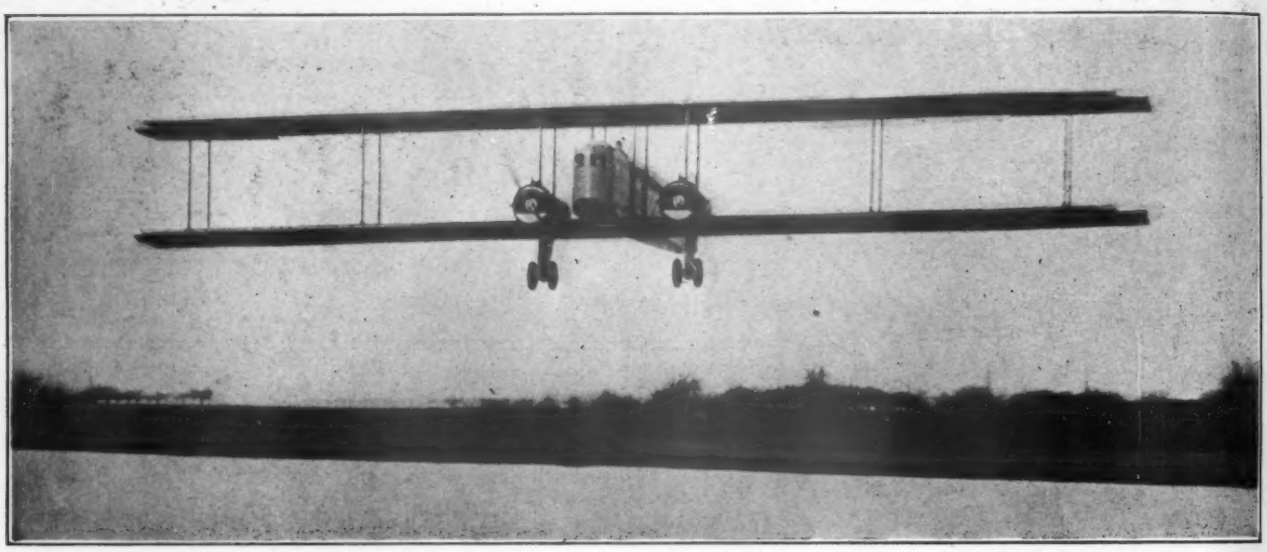
METHOD OF TRANSIT	GOODS TIME	GOODS COST PER CWT.	PASSENGERS. TIME	PASSENGERS. COST
Train and Boat	..		9 hrs.	3 16s.
Fast freight	4 days	11s. 9d	..	..
Slow freight	10 days	6s. 9d	..	..
Motor transport	30 hrs.	25s.	..	..
Air transport	2½ hrs.	55s.	2½ hrs.	6 10s.

LONDON TO MARSEILLES, 700 MILES

Train and Boat			22 hrs.	7 2s.
Fast freight	8 days	17s. 6d	..	..
Slow freight	14 days	9s. 9d	..	..
Boat only	10 days	4s. 6d	10 days	22 0s.
Motor transport	5 days	52s. 6d	..	..
Air transport	8 hrs.	157s.	7 hrs.	17 0s.

Difficulty of Raising Capital

The difficulty today is that of finding capital; to find companies or people who will take a long enough view of the matter, and who can, and are prepared to finance the operation of the services. The Government has very late in the day, promised to subsidize up to a total of £60,000 for this year, but, while this would materially assist if firms were actually operating, it is essential that capital be found to purchase the up-to-date commercial airplanes, which are necessary, and the designs of which are now ready for production, to run the services efficiently and economically and on a profit earning basis. In this connection, on behalf of the Society of British Aircraft Constructors, of which I have the honor to be Chairman, I have submitted a proposal to the Air Ministry that the Government should come forward at this juncture and place orders with our constructing firms for up-to-date commercial aircraft and engines, and that these aircraft should be hired out to the operating companies on a basis to be agreed. The operating companies would naturally be responsible for the full insurance of the aircraft, and the hire payments would no doubt give such a return to the Government as to protect them against loss on the transaction.



FARMAN "GOLIATH" CABIN AIRPLANE USED ON THE PARIS TO LONDON SERVICE BY A FRENCH AIR LINE

At a first glance it will be said that the cost of air transport is high, but you must consider cost in relation to the time occupied. That is, in the case of passengers, time is money, and the business man has so much time saved to devote to other business activities; incidentally he reduces his expenses for hotels, meals, etc., by means of the shorter time used for a journey.

It is important to bear in mind that whereas the older forms of transport have reached a point at which very little reduction in cost of operation is possible, we are only at the beginning with aircraft, and it should be possible to effect a gradual reduction. Take one item alone, the chief item, the cost of running aircraft, that is the bill for petrol. This represents approximately one-third of the total running cost. Every penny reduction per gallon in the price of petrol, or every point that can be saved by improvement of engine or aircraft design, will help toward reducing this very expensive item.

I have addressed my remarks to the business man with the object of trying to show him that the air is an efficient mode of transport—if not at present the most efficient, and that it is to his advantage to use. I do not suggest that aerial transport will displace other forms of transport. Generally speaking, the newer forms of communication have not displaced the old, but have become additional and complementary to them, and I think this will be so with the development of aerial transport.

In addition to this, the Government could have a call on these machines for military purposes. Another advantage of such a step at this time, when unemployment is so widespread and the aircraft industry and its workers are so needful of support, is that it would create employment for a considerable number of workers not only in the construction of the aircraft but in the supply of the materials and components by other trades. This proposition appears to me to be practical and at the same time far better than paying doles to unemployed, and also gives promise of placing aerial transport on a sound basis. Such a constructive step should be handled boldly; that is, enough machines should be purchased to enable British transport companies to enter afresh on the London-Paris and London-Brussels services, and also to open up the air routes to Copenhagen, Berlin, Marseilles and Madrid. If, say, 100 aircraft were ordered from several constructors at a cost of, say, £650,000, a large sum by way of wages will radiate through a number of trades, and a bold bid would be made for the maintenance of our supremacy in the European airways.

I would strongly urge that it is time that not only the Government, but the man with shipping interests, bankers, merchants and manufacturers should get down to this question of aerial transport and see whether there is not good ground for their taking an active interest in it, not only from the point of view of the user, but from the point of view of the capitalist who is prepared to assist in its development.

There is an important national aspect to this question of

* These two journeys may be compared, for American conditions, with those from Washington to New York (216 miles) and New York to Chicago (735 miles).—EDITOR.

commercial aviation which deserves the consideration of the British public and the government. In times of peace, it is obvious that we, as a nation, cannot afford more than a comparatively small standing air force. It follows, therefore, that the only way in which we may have a reserve of air power is by the creation of commercial air fleets.

A most important feature of maintaining a strong mercantiel air fleet is the demands that will be made on our constructors for the design and supply of aircraft which can be continually tried out by practical operation, and concurrently a steady development of the power of aircraft production, combined with the building up of a great industry employing large numbers of workers, will be maintained in this country. We are all for economy, but it is false economy to neglect the development of a form of national defence which can be run on business lines, and this neglect may involve us some day in suddenly spending vast sums of money on the extension of our military and naval air force.

Organization of U. S. Army Air Service

CHIEF OF AIR SERVICE
Maj. Gen. Charles T. Menoher
ASSISTANT CHIEF OF AIR SERVICE
Brig. Gen. William Mitchell
EXECUTIVE
Maj. W. H. Frank
ADMINISTRATIVE EXECUTIVE
Maj. J. W. Simons, Jr.
U. S. SPRUCE PRODUCTION CORP.
Maj. J. E. Fickel (Portland, Ore.)
Capt. W. F. Volandt (Washington, D. C.)
DIRECTOR OF AIRCRAFT PRODUCTION
Capt. W. F. Volandt
LIQUIDATIONS DIVISION
Capt. W. F. Volandt
CLAIMS BOARD (AIR SERVICE)
Capt. W. F. Volandt
FOREIGN AIR ATTACHES
Maj. Melvin Hall (London, England.)
Lt. Col. L. H. Brereton (Paris, France)
Lt. Col. J. E. Chaney (Rome, Italy)
Maj. B. D. Foulois, Military Adviser (Berlin, Germany)
ADVISORY BOARD
Lt. Col. A. L. Fuller, President
SUPPLY GROUP
Lt. Col. W. E. Gillmore, in Charge
Finance Contract Division—Capt. W. F. Volandt
Requirements Division—Maj. Byron Q. Jones.
Property Division—Maj. George H. Brett
Procurement Division—Col. C. G. Hall
Material Disposals and Salvage Division—Col. C. G. Hall
Engineering Division (Dayton, Ohio)—Maj. Thurman H. Bane
Maj. H. W. Harms, Washington Representative
TRAINING AND OPERATIONS GROUP
Lt. Col. J. E. Fechet, in charge
Training Division—Maj. Maxwell Kirby.
Operations Division—Maj. W. G. Kilner.
Civil Affairs Division—Capt. H. E. Hartney.
Balloon and Airship Division—Maj. P. E. Van Nostrand.
ADMINISTRATIVE GROUP
Maj. J. W. Simons, in charge
Medical Division—Col. A. E. Truby
Personnel Division—Maj. Rush B. Lincoln.
Miscellaneous Division—Maj. J. W. Simons, Jr.
INFORMATION GROUP
Maj. H. M. Hickam, in charge
Collection Division—Not yet appointed
Dissemination Division—Capt. Ernest L. Jones
Library Division—Lieut. C. H. Mills
Reproduction Division—T. J. Rowe.
Special Division—Maj. H. M. Hickam.

Geographical Distribution of Fliers

At hearings before Congressional Committees, there was shown a map which illustrated the location of the qualified aviators in the Air Service Officers' Reserve Corps. This map gives an excellent idea of the places where flying could expect to receive support in this country. The significant fact shown by this distribution is that there are fliers in every state of the Union. Of the 5052 aviators listed, 4927 are in aviation and 125 in aerostation.

GEOGRAPHICAL DISTRIBUTION OF QUALIFIED FLIERS OF THE AIR SERVICE, OFFICERS RESERVE CORPS, JAN. 1, 1921.

(PILOTS AND OBSERVERS)

STATE	AVIATION	AEROSTATION	TOTAL
Maine	25	1	26
New Hampshire	21		21
Vermont	18		18
Massachusetts	302	6	308
Rhode Island	14		14
Connecticut	80	2	82
	460	9	469
New York	449	10	459
New Jersey	121	4	125
Delaware	10		10
	580	14	594
Pennsylvania	287	9	296
Maryland	83	2	85
District of Col.	89	1	90
Virginia	73	2	75
	532	14	546
No. Carolina	44		44
So. Carolina	20	1	21
Georgia	71	3	74
Florida	22		22
Alabama	41		41
Mississippi	27	1	28
Tennessee	74		74
Louisiana	30		30
Arkansas	33		33
	362	5	367
W. Virginia	47		47
Ohio	247	6	253
Indiana	121	2	123
Kentucky	42	2	44
	457	10	467
Illinois	376	10	386
Michigan	207	1	208
Wisconsin	105	3	108
	688	14	702
Minnesota	111	4	115
Iowa	137	5	142
Missouri	205	9	214
Kansas	118	1	119
Nebraska	103	10	113
No. Dakota	25		25
So. Dakota	23	1	24
	722	30	752
Oklahoma	69	2	71
Texas	233	5	238
New Mexico	7		7
Arizona	18	2	20
Colorado	65	2	67
	392	11	403
Montana	41	1	42
Wyoming	17	2	19
Idaho	28	1	29
Utah	39		39
Nevada	4	1	5
Washington	97		97
Oregon	54	2	56
California	454	11	465
	734	18	752
Total	4927	125	5052

Dopes and Protective Coverings*

The following data are issued in order to give those concerned a general idea of the various dopes and instructions for applying them to fabrics:

Descriptive

Dope is a somewhat viscous solution of cellulose nitrate or cellulose acetate. In both cellulose acetate and cellulose nitrate dope the constitutents may be grouped into four classes.

(a) *The Film Making Constitutents.*—The bases or film making constitutents for dopes are cellulose nitrate or cellulose acetate. Cellulose nitrate is made by the action of nitric acid on cotton. Cellulose acetate is made by the action of acetic acid and acetic anhydride on cotton. The manufacture of cellulose acetate is more complicated than that of cellulose nitrate, therefore cellulose acetate is more expensive.

(b) *Solvents.*—The solvents are the liquids which are used to dissolve the cellulose nitrate and cellulose acetate. The solvents of cellulose nitrate are ambyl, butyl, and ethyl acetates. The solvents of cellulose acetate are acetone, methyl acetate, methylacetone (depending for its solvent power on its content of acetone), and ethyl formate.

(c) *The Diluents or "Thinners."*—The liquids used as diluents are similar to solvents but do not have quite as much solvent power. They are used primarily to keep down the expenses of the dope mixture. They evaporate completely with the volatile solvents. Common diluents for both acetate and nitrate dopes are benzol, ethyl alcohol, and methyl alcohol. Benzol in excess has some effect on the film, making it brittle.

(d) *Plasticisers, called variously "Softeners" and High Boilers."*—These are solvents of cellulose nitrate and cellulose acetate of comparatively high boiling points—alcohols and esters which evaporate very slowly from the film and render it pliable and to some extent elastic. The plasticisers also help to prevent whitening or "blushing" by redissolving the cellulose acetate or nitrate which has been precipitated out by moisture. Examples of plasticisers for cellulose acetate are benzyl alcohol, diacetone alcohol, benzyl benzoate, benzyl acetate, and triacetin; for cellulose nitrate dope castor oil is commonly used as a nonsolvent softener. Triphenyl phosphate is commonly used in dopes as a softener. Urea is sometimes added as an antiacid to automatically neutralize small amounts of acid sometimes found in dope or developed when the dope film is acted on by light.

Functions of Dope

The dope has two essential functions:

(a) *Shrinking.*—A dope must shrink so that the tautness of the dope-covered fabric is satisfactory for flying. The tautness should also remain fairly constant under various weather conditions.

(b) *Protection.*—The dope film must act as a protective covering for the fabric in order to prevent the rapid deterioration due to weathering. A clear film of either cellulose nitrate or cellulose acetate is transparent to sunlight, which is the greatest factor in the deterioration of dopes and fabrics. To prevent this excessive deterioration, an opaque protective coating on top of the clear dope film is of the utmost importance. The opaque film also aids in decreasing the permeability of the dope film to water, as both the acetate and nitrate clear dope films are permeable to water, the acetate to a greater extent than the nitrate.

The dope film also has a few secondary effects in that it increases the tensile strength of the fabric but decreases the tear resistance slightly, the latter depending to a certain extent on the amount of penetration of the dope into the fabric. Dope films also give a smooth surface to the airfoils and reduce skin friction.

Pigmented Protective Coverings

The opaque coatings which are used are pigments mixed in oil varnishes and designated enamels, or pigments mixed with nitrate dope and designated pigmented dopes.

The various pigmented oil varnishes (enamels) are much slower driers than the above-mentioned pigmented protective coverings of the dope type. Further, it is more difficult to get a pigmented oil varnish which dries with a flat surface, which surface is highly desirable for military use, owing to the absence of flash from the reflection of the sun on the wings while the airplane is in the air. For these two reasons, the use of pigmented protective coverings of the dope type rather than the enamel type is strongly recommended.

The color of the pigmented protective covering to be used on all airplanes is to be standard khaki. The insignia must be applied in the same medium as that composing the protective covering. If colors other than khaki are desired for the purpose of camouflage or for the purpose of making preliminary training airplanes more visible to help avoid collision, or if a special color is desired for any other special purpose, these colors can be furnished in an approved pigmented protective covering.

The Air Service pigmented nitrate dope in the khaki color is known as No. 106 and should be ordered as such. It can also be obtained in the standard red, white and blue insignia colors.

Application of Pigmented Protective Covering

It has been demonstrated repeatedly that the life of the fabric depends on the lasting power of the dope, and its protective covering. A poor dope well applied or a good dope badly applied will appreciably shorten the life of an airplane covering.

Doping Conditions

Doping conditions in the field, whether in the zone of active operations or at a flying field, are generally far from ideal. The principal condition which causes doping trouble is high relative humidity. This causes whitening or "blushing" which, if bad, means that proper adhesion of the dope to the fabric will not follow, and the weathering properties of the covering are materially decreased. Doping should be done as much as possible on the days when the humidity is low or below 75 per cent.

If an inclosed building is available for doping, the relative humidity may be lowered by increasing the temperature. This, however, lowers the viscosity of the dope, and hence increase the covering power to some extent. If the temperature is increased greatly beyond normal doping temperature (75 deg. Fahr.) tests should be made to ascertain whether or not the proper weight of dope film is left on the fabric after drying. This should be from 2 to 2.75 ounces per square yard. If the weight is low, another coat of dope should be added. If a dope contains a fair amount of high boilers, or plasticisers, it will blush less readily than one containing none of these constituents.

Application

The first coat of dope should be a very light coat and should be brushed on, with little altering, to obtain penetration. Subsequent coats should be brushed on in the usual manner for applying varnish and similar materials.

Time of Drying

Under field conditions, time of drying can not be cut down to much under 30 to 45 min. per coat, depending on the temperature. In any case, a coat of dope ought not to be applied until the coat below is bone dry. In factories where ovens at temperatures of 110 to 115 deg. Fahr. are in use this time of drying can be reduced.

Number of Coats

The number of coats is not of so much importance as the tautness. The tautness should be sufficient to give a decid-

* From *Air Service Information Circular.*

ed ring when struck with the knuckle. The weight of the film deposited should not exceed 2.75 oz. per square yard. This amount of cellulose acetate film, with the proper pigmented covering, should give a surface of satisfactory tautness. Four coats of acetate dope should give this weight.

Application of Pigmented Protective Covering

At least one hour should be given the dope to dry before the pigmented protective covering is put on. If enamel is used, one coat applied by brush is sufficient; if Air Service Pigmented Dope No. 106 is used, two coats will probably be necessary, as the covering power by brush or spray gun of this material is less. The pigmented protective covering must not be worked into the dope film. The pigmented oil varnish dries in about twelve hours, while only two or three hours are necessary for the drying of No. 106.

Both materials must be thoroughly stirred before they are poured into the small cans carried by the workmen. This thorough mixing is most important, for the pigments have a tendency to remain near the bottom of the container. If not stirred thoroughly, the covering power will be irregular and the wing streaked and spotted.

At repair depots and fields where compressed air is available the use of the spray gun for the application of pigmented dope is recommended. A spray gun similar to the one made by the De Vilbiss Manufacturing Co., Toledo, Ohio, type M, is very satisfactory. This gun operates on 90 lb. air pressure. The dope is kept in a container under about 15 lb. air pressure. This pressure varies, however, with the viscosity of the dope and the thickness of the coat.

Dope Cans, Brushes, Etc.

Dope cans of the approved "chicken feed" type should be used when they are procurable. In any case dope cans must not be left uncovered. Dope cans should not contain more than 30 to 45 min. supply of dope; otherwise evaporation of solvents and consequent change in viscosity and loss of material may be serious. Dope cans must not be set on the fabric or the surface of the wing.

Brushes should be about 4 in. in width and fairly stiff.

Brushes must be clean in order to obtain the best results. The following cleaning solutions are satisfactory: Cellulose nitrate: 1 part benzol, 3 parts amyl acetate. Cellulose acetate: 1 part benzol, 2 parts acetone.

The receptacles in which the brushes are cleaned should be kept covered when not in use in order to avoid evaporation of the solvent. The brushes will not be injured by allowing them to stand in the solutions while not in use.

Ventilation of Dope Rooms

Dope rooms should be as well ventilated as is practicable considering the necessity of keeping temperature and humidity conditions as nearly as possible constant. No substance whose vapors are toxic are now used in dope, but throat irritation and some exhaustion may follow prolonged exposure to the fumes. Hence men should not be kept more than two hours constantly in the dope room. They should then be given a half hour in the open air. Men should not dope before breakfast or on an entirely empty stomach.

Smoking

On no account should smoking be allowed in the dope room. Not only are dope solvents inflammable, but their vapors form highly explosive mixtures with air.

Dirt

The dope room should be kept as clean as possible. Dirt and dust must be kept off the fabric to be doped. Dope drippings, which by careful application and handling can be reduced to a minimum, should be scraped from the floor and collected, with the possibility in mind of reclamation of the cellulose acetate or cellulose nitrate. Where both cellulose acetate dope and cellulose nitrate dope are being used in the same room this is not so important.

Covering Power of Clear and Pigmented Dopes

It has been found in practice that when four coats of clear dope are applied to fabric-covered surfaces that the covering power will average 1 gallon to 28 square feet of surface. The covering power of Air Service Pigmented Dope No. 106 is 1 gallon to 90 square feet for two coats.

Patching

Never patch over the pigmented protective covering. This must always be removed before the patch is applied. If the pigmented protective coating is similar to Air Service Pigmented Dope No. 106, it may be removed without harming the dope film by a dilute solution of 3 parts amyl acetate to 1 part benzol. Similarly, enamel, i. e., a pigmented oil varnish, may be removed by methyl alcohol or benzol, or a mixture. Do not use dope as a remover for pigmented protective coverings.

After the pigmented protective covering is removed around the hole or tear, the dope film is removed with the above solution of butyl or amyl acetate (if the airplane is doped with nitrate dope), or a dilute solution of acetone or methyl acetate (if an acetate dope has been used), or the following proportions: 1 part methyl ethyl ketone, 6 parts methyl acetate, 2.5 parts benzol.

The dope and pigmented protective covering removers are applied in the same way; i. e., the removing solution is brushed into the surface with a short, stiff brush. Excess of the solvent is removed by vigorous rubbing with a piece of waste or cloth, which at the same time takes off the cover-layer, or the dope, as the case may be. This is repeated as often as is necessary.

After the pigmented protective covering and the dope have been removed, the hole or tear is darned (if it is a bad one) with proper thread. A small patch of the same fabric as the wing (if possible), with the edges frayed, is doped over the wound, the dope being applied both over and under the patch. Patches should be applied, whenever possible, with the same dope, i. e., either acetate or nitrate, as that with which the machine is doped. This is important, as otherwise poor adhesion may result.

The patch and this first layer of dope are allowed to dry, and three or more coats applied on top in the usual manner, with the usual precautions. When thoroughly dry, the patch is covered by a coat of pigmented protective covering.

Oil Spots

Occasional oil or grease spots on the fabric before doping may be removed by the use of benzol. The spot is rubbed gently with a piece of clean waste, soaked in benzol and let dry very thoroughly before doping. If the oil spot is left untreated the dope is liable to bubble or blister at this point. Oil spots on the fabric before doping are not necessary and should be avoided. Occasional spots may be removed as above.

Factory Marks on Airplanes and Airplane Parts

To determine what dope and what pigmented protective coverings were used in finishing a doped part in the factory, it is necessary to consult the factory markings. These will be found in general on the under side of the ailerons; more specifically on the right-hand side of fuselage surfaces, on the right-hand side of rudder surfaces near the pivot edge, and on fins at the right-hand side near the line where it joins the fuselage assembly.

In the factory marking scheme the number-letter groups (which are separated by dashes) indicate the name of the factory or flying field making or repairing the part.

The second group of numbers and letters indicates: First, the formula of the dope (indicated by the key number placed first), then "D" (indicating that the number-letter group refers to dope); finally, a figure indicating the number of coats of dope.

The third group of numbers and letters indicates: First, the pigmented protective covering used (indicated by the key number placed first), then PV if a pigmented varnish (enamel) was used, or PD if a pigmented nitrate dope was used (P. A. if pigmented acetate dope was used); finally, a figure indicating the number of coats of the pigmented protective covering.

The fourth number-group is the date of the application of the pigmented covering expressed in the usual way (month-day-year).

For example: x-10D5-12PD2-6-29-18 means: This piece was

doped at X's factory; 5 coats of No. 10 dope were used; the surface was finished with 2 coats of pigmented dope No. 12, on June 29, 1918.

Key lists for the dope numbers and pigmented protective covering numbers are given in Engineering Division Information Circular No. 94, issued March 21, 1919. This circular can be obtained from the office of the Chief of Air Service, Washington, D. C.

Aerial Activity in Japan

The following information is from a report of A. E. Bryan, Canadian trade commissioner at Yokohama, Japan:—

The Aeronautical Association is stimulating a more active interest in airplanes and their use for commercial purposes. The Government authorities are also paying far more attention to this field than formerly, and a larger portion of the estimates asked this year by the War Department will be used to carry out the year's proposed operations and expansions.

About a year ago a party of sixty French experts came out to Japan on the invitation of the Imperial authorities for the purpose of instructing Japanese air pilots. These Frenchmen were all experienced and did much to stimulate this branch of Japan's military operations. It is now said that a party of British naval air pilots will arrive shortly to give instructions to the Imperial Japanese Air Service. Nine British constructional experts from the Vickers-Armstrong works arrived in this country last week to superintend the erection of what will be the first up-to-date airplane factory in Japan, to be built at Nagoya by the Mitsui interests.

Air Mail Service Being Organized

The question of opening an air mail service by the Department of Communications has been considered and it has been finally decided to institute the same some time this year between Tokyo and Osaka. The operation of this service will probably be based on the report of a Mr. Oyamada, who was sent abroad to study similar undertakings in Europe and America. Other proposed routes will be one to Kyushu in the south and Aomori in the north.

The Imperial Aviation Society is arranging a competitive flight between Tokyo and Aomori in August, which carries a prize of yen 15,000 for the winner. A mail-carrying flight will also be held between the same points, when prizes amounting to yen 10,000 will be given. This society is also arranging a transoceanic flight between Fukuoka and Shanghai, to be held next October, and is offering yen 50,000 and yen 30,000 as the first and second prizes respectively. There is also under consideration the establishment of a mail service by the Communications Department with the help of the naval authorities between Tokyo and the Bonin islands, a distance of 530 miles.

The vernacular paper *Chuo* states that a Mr. Ryokan Tachiban and Takichi Hashimoto are about to establish a company with capital of yen 10,000,000 for the purpose of opening a passenger service between Osaka and Tokyo. Other private companies of a similar nature have been talked of. Laws and regulations are now being drafted by the Aviation Bureau for the purpose of regulating flying, outlining the districts where flying is forbidden, prohibiting stunt flying, etc., etc. All pilots and airplanes must be licensed according to these new regulations.

Airplane Construction in Japan

Up to the present no planes of any account have been built in Japan. Beside the Imperial Arsenal, one or two small plants have been making airplanes with imported parts, but these have lacked the proper financial support to make them pay. One large shipbuilding firm in Kobe and another large concern in Toyko have been erecting airplanes as a sideline, but only on a limited scale.

Most of the machines in use at the present time are of European origin. The French instructors brought considerable numbers of French airplanes, which they left here on their departure. One or two of the important British makers have representatives in Tokyo who have sold machines to the Japanese authorities. Seventeen airplanes arrived recently from Germany, under the terms of the Versailles Treaty, and these will be used for experimental purposes.

The authorities are, however, beginning to build airplanes in the Imperial Arsenal at Tokyo—up to the present it is said that the engines are being imported from abroad.

Seaplanes to Map Mississippi Delta

In connection with the War Department's photographic mapping of the Delta of the Mississippi River, problems arose, because of the peculiar character of the territory to be photographed which could only be overcome by the use of seaplanes. Consequently, the Secretary of War requested the Navy Department to take strips of mapping photographs on each bank of the South and Southwest Passes of the Mississippi to cover the marshy areas of each bank to the limit of their extent up to two miles from the river. This work is necessary in connection with the engineering projects of the Army District Engineer, and is of tremendous importance in the river and harbor improvement schemes at the mouth of the Mississippi.

The mapping could not be performed by the Army Air Service, principally due to the lack of landing fields in the vicinity. But while it has no aviation facilities in the Delta, the Army is to supply the gasoline and oil for the mapping planes and subsistance for the crews.

Work on this project will start immediately. Seaplanes from the U. S. Naval Air Station at Pensacola will conduct the mapping work, and, after finishing the photographic flights requested by the Army, will obtain additional pictures for the Coast and Geodetic Survey, in order to complete the maps which that bureau has under way of the Gulf Coast. It is estimated that by mapping these inaccessible areas from the air, many thousands of dollars will be saved over the old method of triangular and surface maping and survey.

This work not only shows the cooperation existing between the Army and Naval Aviation, but also the close cooperation between Naval Aviation and Coast and Geodetic Survey, this Delta mapping being only one of many projects of the same kind which the Navy has undertaken for both departments.

Saved by Airplanes

Perhaps for the first time airplanes were used on errands of mercy during the violent earthquakes which occured in Argentine and Chile, and caused the destruction of several towns and villages and great loss of life. Several squadrons rendered invaluable assistance in exploring the vast devastated areas where all means of communication had been destroyed.

The airmen cooperated with the Red Cross in transporting doctors, as well as food and medical supplies to places which could not otherwise have been reached for a long time. This example of cooperation between the aviator and the organization of mercy offers new and great possibilities. It demonstrates that the airplane, after having been a powerful weapon of destruction, can be the means of bringing Red Cross assistance with great speed to the scene of the disaster otherwise inaccessible, and suggests the hope of permanency in Red Cross cooperation with Government aviation centers.

S.V.A. Sales Increase

The Aero Import Corp. of 1819 Broadway, report the following sales:—

One two-place airplane to William A. Larned, ex-national tennis champion; three S.V.A. two-place machines to Gates, Morris Co., Redwood City, Cal.; four two-place machines to Humphreys Airplane Co., Denver, Col., and the same concern is now negotiating for a three-seater.

G. W. Puflea, who recently made a remarkable flight with a Lincoln-Standard machine from Lincoln, Neb., to Mexico City, has placed an order for one six-place Ansaldo Limousine, while the Ralph C. Diggins Co., of Chicago, have also ordered one six-place Ansaldo Limousine, and are negotiating for two more.

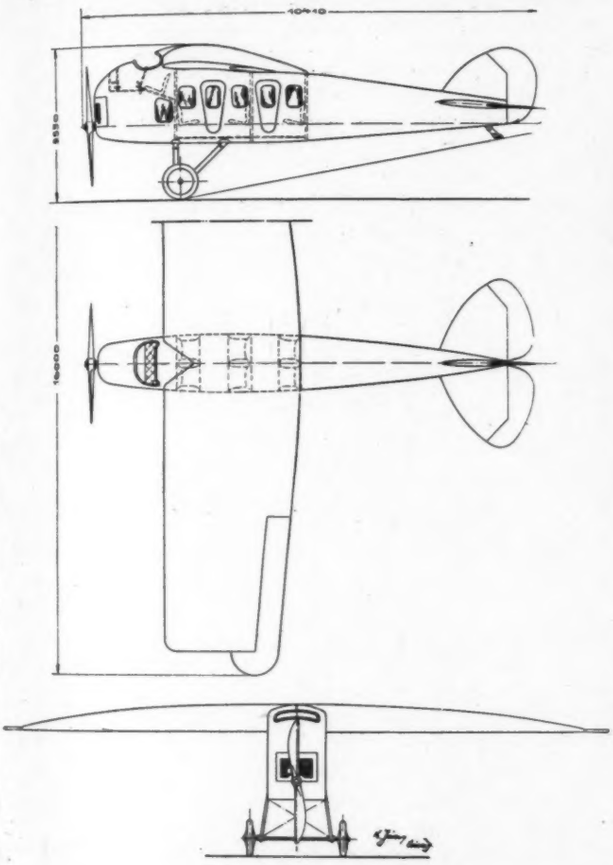
The Aero Import Co. has also arranged to ship on consignment to their western distributors parts for every Ansaldo airplane flying west of the Mississippi River.

Albatros 8-Seater Cabin Monoplane

By Erik Hildesheim

The Albatros 8-seater cabin monoplane which is illustrated herewith is the first specialy designed commercial airplane of the Albatros Co., of Berlin, the well-known German firm which during the war produced many types of observation and pursuit machines for the German air force.

At first sight the Albatros 8-seater shows a considerable resemblance with the Fokker cabin monoplane which was described in the Dec. 6, 1920, issue of AVIATION AND AIRCRAFT JOURNAL. The general lay-out—cantilever monoplane wings with an underslung fuselage accommodating the passengers in a cabin and with the pilot seated in front—are the same in the two types, but the Albatros 8-seater embodies a number of refinements and has in general more pleasing lines than the Fokker.



OUTLINE DRAWINGS OF THE ALBATROS 8-SEATER CABIN MONOPLANE

It is rather significant that the Albatros Co. should just like the Fokker Co., adopt for its post-war products the cantilever monoplane, although both firms built mainly biplanes during the war.

The Albatros 8-seater has thick, 3-ply covered wings which taper toward the tips in both chord and depth, and are fitted with balanced ailerons. The wings are of one piece, internally braced, and are fastened directly onto the top longitudinals of the fuselage. The surface area is 520 sq. ft. The span is 51 ft. and the mean chord 10 ft. 6 in.

The tail unit is also internally braced, the stabilizer and the vertical fin being built up of veneer, while elevator and rudder have frames of duralumin tubing.

The passenger cabin, seating six persons, is fitted just below the wings. Two doors on either side afford the passengers easy access and egress. The pilot's cockpit, seating two, is in front of the cabin, on top of the engine. This arrangement has the advantage of enabling the pilot to have an excellent view downward and also to keep the weights more closely massed. The overall length, from propeller hub to the rudder edge, is 34 ft. 3 in. and the overall length is 11 ft. 6 in.

The landing gear is of the V type, with a wheelbase of 6 ft. 6 in. and 810 x 125 mm. tires. The axle is rubber-sprung.

The power plant may consist of either the 170 hp. Mercedes D.IIIa, the 185 hp. B.M.W. IIIa, or the 200 hp. Benz IV engines. In each case sufficient fuel is carried for a flight of three hours with full load. As the Benz engine is about 200 lb. heavier than either the Mercedes or the B.M.W. types cited, the power loading of the machine is accordingly higher. The weights and the performances of the Albatros 8-seater as fitted with the three different engines are given by the manufacturers as follows:—

ALBATROS 8-SEATER CABIN MONOPLANE LANDING

	Mercedes	B.M.W.	Benz
Weight empty	1,036 kg.	1,051 kg.	1,142 kg.
Useful load	874 kg.	859 kg.	868 kg.
(Fuel and oil	156 kg.	148 kg.	159 kg.)
Weight loaded	1,910 kg.	1,901 kg.	2,010 kg.
Speed at 300 m.	149 km.p.h.	154 km.p.h.	160 km.p.h.
1000 m.	147 km.p.h.	153 km.p.h.	159 km.p.h.
2000 m.	144 km.p.h.	150 km.p.h.	155 km.p.h.
Climb to 4000 ft. in	13 min.	10 min.	
6000 ft.	24 min.	18 min.	
10000 ft.	70 min.	43 min.	

In the figures given as useful load the weight of the pilot, the mechanic and the six passengers is assumed to be 70 kg. each.

The take-off and landing runs of the machine are approximately 300 ft.

French Woman Aviator Crosses the Andes

Mme. Adrienne Bolland, a French aviator, on April 1, last, flew across the Andes Mountains from Mendoza, Argentina, to Chili. Madame Bolland flew a Caudron biplane equipped with an 80 hp. rotary engine. She is the first woman to have crossed the Andes by aircraft.

The Need of a Bureau of Naval Aeronautics

Experience since the War has proved that Naval Aviation is so important to the Navy, that it will constantly expand and its problems will constantly increase, and, in fact, already have increased to a point where the present organization in the Department for handling aeronautical matters is inadequate for the duties imposed. The solution can best be arrived at by the organization within the Navy of a Bureau of Aeronautics.

To Remedy an Anomalous Situation

At the present time the Director of Naval Aviation is the Senior member of the Aviation Section of the Planning Division of Naval Operations. The Director of Naval Aviation has no authority, according to the present organization of the Navy Department, to direct aviation, and what success has been attained is due solely to the cooperation extended by the different Bureaus who have disregarded the strict letter of the law and have given assistance in spite of the written organization.

As a matter of fact, the Director of Naval Aviation has no administrative power whatever. When he wants to transfer men and officers from place to place he must make his request for such transfers to the Bureau of Navigation. When he wants certain construction work done he must make a request to the Bureau of Construction and Repair. When he wants a motor, a request must be made to the Bureau of Engineering. When he wants a certain type of aircraft gun he must make a request to the Bureau of Ordnance, and it must be remembered that he cannot make his requests direct to the Bureaus, but must go through the Chief of Naval Operations. It is perfectly obvious that a military organization cannot be operated when everything is based on a system of requests. The Director of Naval Aviation must be clothed with authority to *order* what he needs.

When war plans are being compiled it is necessary to *request* personnel information from one place, material information from another place, statistical from another, and historical information from still another. All this information should be at hand for immediate use. Owing to the waste of time required to rush around from one bureau to another in requesting information that often cannot be promptly supplied, Naval Aviation is seriously handicapped under this scheme.

The need of a Bureau of Aeronautics in the Navy, which is purely a matter of internal departmental organization, is understood by everyone concerned and has the approval of the entire Navy, from the highest officer down.

In submitting a bill for the establishment of a Bureau of Aeronautics, Congressman Hicks made the following statement:—

"This bill has the unanimous support of the Committee of Naval Affairs, who, after hearings and discussion, strongly urge its adoption as being necessary for the proper development of naval aviation.

"The bill also has the indorsement of the National Advisory Committee on Aeronautics; the Secretary of the Navy, the Chief of Naval Operations; Admiral Coontz, in whose office aviation is now established; the Chief of the Bureau of Construction, Admiral Taylor, whose bureau has to do with the design of aircraft; the Director of Naval Aviation; and others who have had experience with aviation and whose opinions are valuable.

A Parallel in the Army Organization

"The need for such an establishment in the War Department was recognized by the Military Committees of both the House and the Senate, and by Congress as well, in the act passed last spring whereby there was created an Air Service as an independent arm of the Military Establishment. The same arguments that were used for the creation of the Army Air Service apply with equal force to the establishment of a naval air service.

"The committee feels that in order that this branch of the naval service may function economically and properly and produce the maximum of efficiency this law is urgently needed for the present program.

"The purpose of this bill is to concentrate under one head the aviation activities now scattered through the Navy department; to centralize in one bureau the work now carried on in several, and by coordination under one authority to effect economy of energy and curtail duplication of effort.

"Aviation is new and is developing rapidly, and attendant upon such development is the usual large amount of executive and administrative details. There are new regulations to make covering naval aviation. There are new policies to lay down, and these policies must change from time to time as the science of aviation develops. There is much information and assistance to be given to civil aviation. There is liaison to form with foreign governments. There is cooperation to be brought about between the Army and Navy and with civil aviation.

"The importance of aviation as an effective military arm, the value of which it is difficult to overestimate, warrants, in the judgment of the committee, the creation of such a bureau similar in organization to the department bureaus already in existence.

Present System Is Unworkable

"The director of Naval Aviation has no administrative or executive power whatever. He is simply the senior member of the aviation section of the planning division of the Office of Naval Operations. The Chief of Naval Operations is charged with the administration of aviation, and he personally has to pass upon aviation details. This makes the control of aviation slower and more difficult than should be the case, for this officer not only is responsible for general naval duties similar to those performed by the Chief of Staff of the Army but he is, in addition, charged with responsibility for all naval operations.

"The Director of Naval Aviation, being simply head of a subsection of the Planning Division, is theoretically only supposed to be charged with the drawing up of aviation plans. Yet, as a matter of fact, because of the inadequacy of the present naval organization as regards a new arm, he is indirectly charged with responsibility for all aviation, but he has no authority and no proper machinery with which to work.

"A legalized bureau with a definite organization that will permit the coordination of the important work confronting aviation would give to aviation the place to which it properly belongs in the Navy. The technical aviation sections of all bureaus should be detailed under the bureau of aviation to avoid the delays and inadvertencies caused through the great effort necessary to obtain concerted action in aviation affairs. The formation of a new bureau would require only a small interdepartmental change, giving to the director of aviation an administrative and executive function, and legalizing responsibility for this new arm.

Objects of the Bureau of Naval Aviation

"Here are briefly some of the objects sought to be accomplished by the creation of this bureau:

(a) To bring into direct and close physical contact and relationship the numerous offices of the Navy Department now charged with cognizance of aviation affairs.

(b) To create an office in the Navy Department where there is definite responsibilty for naval aviation affairs and where sufficient authority exists to insure progress in aeronautic development.

(c) To create an office to which the Chief of Operation may turn for cognizance and action in aeronautical matters.

(d) To create a centralized office which can deal with other departments of the Government in aeronautics and with questions of civil aviation.

(e) To place the expenditure of funds under the control of one responsible authority, thereby simplifying and coordinating supply, construction, and upkeep.

(f) To centralize control of experimental work. Beneficial

results can not be obtained unless experiments are conducted so that development of the various arms of aviation go hand in hand and are administered from a central controlling authority.

(g) To simplify and decrease correspondence, both in the Navy Department and with the air stations, thereby facilitating the problem of supply at the stations and their military operations.

"At the present time specifications and construction of aircraft are under the Bureau of Construction; motors and radio apparatus under the Bureau of Engineering; training of personnel and instruments under the Bureau of Navigation; armament under the Bureau of Ordnance. It is manifestly impossible for one office properly to supervise aviation activities as long as each of its many parts are separated in the various bureaus, and there is no bureau where the authority is centralized. In each of the existing bureaus, aviation is a small part of the work of the bureau and the result too often has been delay if not indifference to the needs of aviation."

Air Service Engineering School

Minimum Requirements for Admission

In order to make efficient use of the time which the regular course in the Air Service Engineering School, Dayton, Ohio, is allotted, the following are the *minimum* requirements of previous training:

1. Rating as Airplane Pilot.
2. Technical and educational requirements. One of the following:
   a. Graduate of Military or Naval Academy.
   b. Graduate of recognized technical college.
   c. A thorough High School education and well versed in the fundamental sciences to the degree outlined below and exceptional experience along lines of special importance to the Air Service.

Subjects and typical texts, with the equivalent of which the candidate should be familiar.

THE CALCULUS. Any text.

CHEMISTRY. Elementary college chemistry.
College Chemistry by Alexander Smith.

PHYSICS. Duff.
All topics having a bearing on present-day engineering in physics are included, for instance thermodynamics, electricity, etc.

THEORETICAL MECHANICS. Theory and Practice of Mechanics by Slocum.
The candidate need only be able to read any part of this text and understand it.

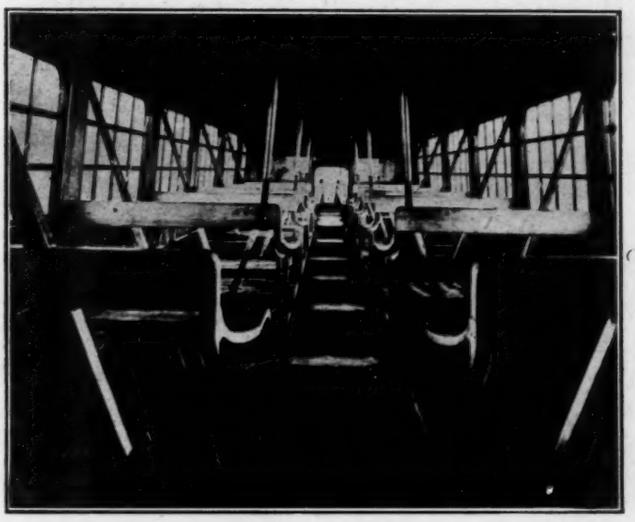
Course of Instruction at Engineering School and Requirements

The applicatory method of instruction in the Air Service Engineering School is used wherever time permits in order to emphasize the fact that engineering knowledge is available in all branches to all of average ability who care to work for it, and that practically all fundamental information may be found written in existing books or documents. Facilities for instruction are unusually complete. In general, the specialists of the Engineering Division are available to carry out the immediate consultation work in conjunction with any particular subject. In each course, the student is provided at the start with a set of instructions, a list of references and a number of problems with methods explained wherever necessary. It is impossible to make experts out of students in any one subject; but the aim is to, at least, arouse the students' interest in engineering reports and data, to point out the extent of each subject and also where the best and most reliable information on these subjects can be found, to effect an appreciation of the engineering problems in aeronautics. It is hoped in this course to develop any latent ability in a student officer for some phase of engineering with a view to a possible specialization along that line in the future with a resultant all-round advantage to the Service. The operation of the School has been mutually beneficial to both the Engineering Division and the student officers themselves through the exchange of ideas, and it affords a means to a common understanding between the technical and the service organizations.

It is desired to develop personal initiative and mental confidence in this school to such a point that practically no instruction will be required. This is based on the assumption that any problem, the solution of which is dug out by individual effort is much more valuable to the student than a solution in which he is assisted by an instructor. On the first hand, the method of solving the problem is more thoroughly learned by the fact that it has had to be accomplished without assistance. On the second hand and by far of the greater advantage, confidence is developed in a student that will go a great way toward rounding out and improving his education. There certainly is nothing more valuable than the realization on the part of the student that practically all knowledge has been laid down in written books and that this can be obtained by the student by a little personal application. In other words, it is hoped to develop a studious frame of mind so that the student officer after completing the course, will not assume that he has learned all that is to be learned but will continue getting all books, reports, etc., published on aviation and the sciences involved in aviation.

The Value of Technical Training

It is hoped that the student officer will get a point of view and a sufficient knowledge to allow them to speak the language of engineering and that a deep interest in mechanical matters will be instilled in them which will result in their returning to their stations with an educational foundation and an interest in technical matters which will cause them to continue



INTERIOR VIEW OF THE PASSENGER QUARTERS OF THE CAPRONI EPOCA
(c) *Kadel & Herbert*

reading, studying and constantly improving themselves as Air Service officers. There is nothing more essential and fundamental to an organization such as the Air Service as a studious, ambitious, hardworking personnel that is constantly striving to learn more thoroughly the game in which they are engaged. One hour a day devoted to study by every officer in the Air Service would do more than anything else to place the Air Service in a position to make the rapid advances which it should make. It cannot be hoped that the proper development will take place, if all the thinking is done by a small Engineering Division which has no opportunity of getting out into the field and using the equipment which it develops.

The course is not a competitive course. A conscientious application and a good honest effort on the part of a student to get all he can out of the course is the requirement. There is no intention to force any information on any student.

It should be remembered that the course is designed to be of general use to air officers and not for officers who desire to specialize in engineering, only. It is believed any air officer will be a better squadron commander, maintenance officer, radio officer, photograph officer or commanding officer of an air station for having had the course. There is no obligation to continue in engineering work.

California Aero News

The only airship in Southern California, a pony blimp built by the Goodyear Co., has been flown for about a year in the vicinity of Los Angeles. It was sold to the Marshall Neilan Productions, a moving picture concern, and therefore taken out of the service to Santa Catalina Island. The Catalina service was quite successful, especially in carrying passengers at the Island. Mr. Neilan took the blimp into Montana and used it for filming a very large picture entitled "Custer's Last Stand", and a number of smaller pictures with Indian scenes. George Hockensmith, aeronautical superintendent of the Goodyear Co. here, states that the blimp did considerable work in Montana at a high altitude and made a cross country flight from one picture location to another of more than 300 miles. The Neilan Co. is using this ship now for pictures, and when not in use it is utilized by the pilot, Mr. Wollam, to carry passengers. The Army has a similar small airship at the Balloon School, but has not inflated it. The Navy has a C-type airship at San Diego and is using it daily. It is occasionally flown to Los Angeles from San Diego.

A dirigible race was held between the Neilan blimp and the Navy C-Type at the Winter Air Tournament at Long Beach on Dec. 26. It proved one of the most interesting features of the tournament and aroused a great deal of comment from the spectators.

There is at present no plan to put lighter-than-aircraft into commercial transportation in California. Various estimates and maps of routes from Los Angeles to San Diego and San Francisco have been furnished to men planning to utilize two or three 12 passenger airships, but none has materialized with adequate capital. In order to make this a success it would call for a passenger rate of around $35.00 for a 340 mile trip along the California coast.

The Secretary of the Navy is interested in rigid airship work on the Pacific coast. If Congress allows any airship activity in the Navy a very large rigid station will be built on the old Camp Kearney site near San Diego. This has been made available for the Navy with a large amount of improvements put in during the war. It is sufficiently inland to be desirable for rigid airships, and its climatic situation is ideal.

There has been a great deal of heavier-than-air activity, and something of this sort is taking place each month. It is possible to fly practically 357 days of the year. Before the war there was a great deal of ballooning, but there has been practically no civilian activity with balloons since the war.

The Army Balloon School at Arcadia, Cal. is continuing free balloon training and sends out men with 19,000 and 35,000 cu. ft. balloons quite frequently. The Aero Club of Southern California has practically all flying interests united in one organization, and also has the support of Chambers of Commerce and civic organizations, and of the City and County locally. Members have flown approximately a million miles since commercial flying was renewed. The Club was organized in February, 1920, has had one successful air meet, and is now conducting a series of racing contests. It endeavors to do practical work of value to manufacturing and commercial flying generally as well as to keep up the social interest.

Any commercial organization which may plan to establish air transport or manufacturing in Southern California can be given information by the club, especially in relation to flying conditions and routes of travel. Air routes have been developed and information listed as to flying conditions and landing fields east into Texas and north through California.

Want Air Mail

The following places have applied for the extenison of air mail, an indication of the demand for this new postal service: Arkansas City, Kans.; Akron, Ohio; Atlanta, Ga.; Austin, Tex.; Adrian, Mich.; Albany, N. Y.; Argo, La.; Alva, Okla.; Altus, Okla.; Binghamton, N Y.; Baltimore, Md.; Boise, Idaho; Boonville, Mo.; Bedford, Mass.; Bridgeport, Conn.; Boston, Mass.; Birmingham, Ala.; Bartlesville, Okla.; Bryan, Ohio; Buffalo, N. Y.; Chicago, Ill.; Canton, Ohio; Corning, N. Y.; Charleston, W. Va.; Corinth, Miss.; Corsicana, Tex.; Cheyenne, Wyo.; Chesterfield, S. C.; Concord, N. H.; Charlotte, N. C.; Covington, Ky.; Cleveland, Tenn.; Council Bluffs, Iowa; Chickasha, Okla.; Detroit, Mich.; Denver, Colo.; Dallas, Tex.; Elizabeth, N. J.; Eldorado, Kans.; Eau Claire, Wis.; Eureka, Calif.; Enid, Okla.; El Reno, Okla.; Elmira, N. Y.; Fort Smith, Ark.; Flint, Mich.; Gastonia, N. C.; Gainesville, N. C.; Grands Rapids, Mich.; Habana, Cuba; Hartford, Conn.; Haverhill, Mass.; Hobart, Okla.; Indianapolis, Ind.; Ithaca, N. Y.; Joplin, Mo.; Jefferson Barracks, Mo.; Key West, Fla.; Kendallville, Ind.; Kansas City, Mo.; Kelleys Island, Ohio; Lexington, Ky.; Lorain, Ohio; Livingston, Mont.; Ladysmith, Wis.; Little Rock, Ark.; Lordsburg, N. Mex.; Little Falls, N. Y.; Los Angeles, Calif.; Lake Charles, La.; Lawton, Okla.; La Crosse, Wis.; Minneapolis, Minn.; Madison, Wis.; Memphis, Tenn.; Millington, Tenn.; Marion, Ohio; Mangum, Okla.; Marshall, Mich.; Muskogee, Okla.; Marlin, Tex.; Mason City, Iowa; Mobile, Ala.; Montgomery, Ala.; Muskegon, Mich.; Morehead City, N. C.; Milwaukee, Wis.; New York City; New Orleans, La.; Nantucket, Mass.; Navasota, Tex.; Nashville, Tenn.; New Britain, Conn.; Omaha, Nebr.; Oklahoma City, Okla.; Ogden, Utah; Oakley, Kans.; Pittsburgh, Pa.; Philadelphia, Pa.; Parsons, Kans.; Phoenix, Ariz.; Pensacola, Fla.; Panama Canal Zone; Pasadena, Calif.; Quiney, Ill.; Rome, Ga.; Rochester, N. Y.; Spartanburg, S. C.; Scranton, Pa.; St. Paul, Minn.; St. Louis, Mo.; Sioux Falls, S. Dak.; Salt Lake City, Utah; Seattle, Wash.; San Francisco, Calif.; Temple, Tex.; Toledo, Ohio; Tulsa, Okla.; Tampa, Fla.; Texarkana, Tex.; Takoma, Wash.; Union City, Tenn.; Wheeling, W. Va.; Waterbury, Conn.; Worcester, Mass.; Wilkes-Barre, Pa.; Winona, Minn.; Woodward, Okla.

San Francisco Aerial Day

The Board of Supervisors of San Francisco on Feb. 14 unanimously passed the following resolution:—

WHEREAS, Lincoln Beachey, pioneer aviator and San Franciscan, met his death on the second Sunday in March of 1915,

AND, WHEREAS, on that day of each succeeding year, Lillian Gatlin has made a flight and scattered pink roses on the waters of the Pacific ocean in tribute to him, and to his mother, Amy Beachey,

AND, WHEREAS, through the recognition and the response of the people, the occasion has grown to include tribute to all mothers whose sons flew on while aeronautics was being perfected as a science, and that we might have world peace,

AND, WHEREAS, the tribute now has large significance, and a committee has been formed to represent San Francisco on the occasion this year,

BE IT RESOLVED that the Board of Supervisors do hereby request James Rolph, Jr. Mayor of San Francisco, to set aside Sunday, March 13, 1921, as Aerial Day, and to invite the people of San Francisco to participate in so commendable a tribute.

The resolution has now been endorsed by Mayor Rolph, who has issued an official preclamation to this respect.

Foreign Air Officers Training in U. S.

Below is a list of foreign air officers who are taking training courses at U. S. Army Air Service Schools:—

Gilardi, Carlos, Lt. (Peru), Cooper, H. Zuniga, Lt. (Chili), Garrasco, J. Arvalor, Lt. (Chili), Granados, Miguel, G. (Guatemala), Carlstrom Field; Arozarena, M. Capt. (Cuba), March Field; Laborde, Eddie, 2nd Lieut. (Cuba), Teran, Humberto, Lt. (Ecuador), Freile, Guillimo, Lt. (Ecuador), Carlstrom Field.

Lt. Guilimo Freile has recently been transferred to A. S. Mechanics School.

Request has been made for transfer of Lt. Humberto Teran to Photographic School at Langley Field, Hampton, Va.

Request made for Ensign Victor M. Padula and Silvio Leporac of the Argentine Navy, to be given flying training at Carlstrom Field and for Leriere Bastos of the Portugese Army to be given one month's training at Engineering School, Dayton, Ohio.

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Aircraft and National Defense

Many ill-informed statements upon the relation of aircraft to National Defense are current. These react unfavorably upon the public and our legislators and tend to cloud vital questions of national policy.

A recent instance of this followed the storm created in army, navy and aviation circles by Brig.-Gen. William Mitchell's able testimony upon the effectiveness of bombing and torpedo planes against surface ships.

Radical changes in Government policy toward aviation are imminent. These developments are expertly and intelligently covered in AVIATION AND AIRCRAFT JOURNAL, together with the weekly news and authentic technical articles.

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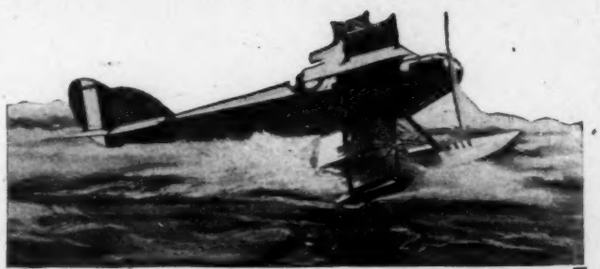

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of AVIATION AND AIRCRAFT JOURNAL published weekly at Highland, N. Y., for April 1, 1921.

State of New York
County of New York ss.

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared George Newbold, who having been duly sworn according to law, deposes and says that he is the Business Manager of AVIATION AND AIRCRAFT JOURNAL and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, The Gardner, Moffat Co., Inc., Highland, N. Y.; Editor, Ladislas D'Orcy, 225 Fourth Ave., New York, N. Y.; Managing Editor, None; Business Manager, George Newbold, 225 Fourth Ave., New York, N. Y.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

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4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

GEO. NEWBOLD.

Sworn to and subscribed before me this 8th day of April, 1921.

(Seal.) FRANKLIN H. BROWN,
Notary Public, Kings County, No. 514.
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